COAL AGE

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DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

SYDNEY A. HALE, *Editor*

New York, September, 1933

Code Making

SALVATION of the bituminous coal industry via the code-making route of the National Industrial Recovery Act is proving to be a long and stony road. Agreement upon what constitute unfair trade practices has been relatively simple, but upon the vital questions of administration, wages and sales control there has been a multitude of opinion. Initial efforts of the administration to reconcile the differences expressed in the thirty-odd codes and supplements submitted by the industry brought unanimity only in objection to many of the proposals suggested by the draftsmen for the National Recovery Administration. Critical comment in advance of an opportunity to study carefully the completed work of the groups laboring on the code, therefore, would be merely useless speculation.

Who Pays?

WHATEVER the situation may be in other industries, there is no denying that any increases in wage rates in bituminous coal mining must be reflected immediately in higher prices to the consumer. That is a fact of which the National Recovery Administration, fortunately, is acutely aware. General Johnson, too, is keenly alive to the further fact that a large part of the financial difficulties of many producing companies may be traced to the ridiculously low prices at which millions of tons of coal annually are sold to industrial consumers, railroads and public utilities. As emphasized in his Boston speech last month, such prices inevitably undermine any decent wage structure.

But there is another aspect of this situation equally important; that is the effect such low prices on industrial coal have had upon the prices on that part of the national soft-coal output which finds its way into the cellars of the domestic consumer. One result of this loading of prices on prepared coal has been to make that profitable buyer more susceptible to the appeals of competitive fuels. To support a depressed level of steam-coal prices the industry jeopardizes the maintenance of a profitable domestic market.

Here is a situation in which the National Recovery Administration might play a dominant rôle. Through its control over all industry, it is in a position to impress upon large industrial consumers the evil train of consequences which follows their purchases of coal at less than the cost of production and to give the coal industry some measure of protection from unfair competition from oil and gas. Could it do this and place industrial coal business as a whole on a profitable basis, then the bituminous coal industry might be able to reduce the cost of coal to the household consumer. That, in an era of rising prices, would be no mean achievement.

Do You Know?

EVERY mine manager ought to know definitely just what he can, with economy, expend to obtain definite objectives in each phase of his operations, and, when that is known, changes should be made consistently that will assure that these objectives will be attained. One should know, for instance, just how many cubic feet of bottom can be lifted and how much top can be

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shot down to obtain a definite limiting gradient over which to haul the coal which must pass over a given road, what capacity of feeders and returns should be installed to get economical service from mine equipment (having in view just how much tonnage the equipment will have to produce), how far it is profitable to go without advancing motor-generator sets.

In too many cases, such practice is regulated not on a figured basis of economy but by guesswork or purely by a desire to avoid cost of any kind regardless of the profit to be obtained from better construction methods. Many details of construction can be laid down after study, and these can be made standards of operation; their costs in many cases can be anticipated, and provision in advance can be made for them. Grading is not one of these latter, but line construction indubitably is, though only in so far as it is not affected by gradients to be surmounted, hardness of coal to be cut, or price to be paid for equipment. Thus, one can be prepared in advance to meet all costs as they become necessary. Such equipment, in the location in which it is first placed, may not return the money expended on it, but may assure handsome dividends when attention is paid to the possibility of using the equipment in some other place later.

Attention and time expended in the formulation of good standards of construction, with suitable provision, if possible, for reuse, is abundantly repaid. It may save excessive expenditures for which there will be no adequate return as well as provide that all expenditures will promptly be made from which suitable profit may be obtained. Any good engineer can figure good practice, but the engineer who is worth his salt is one who can estimate just how much equipment it is profitable to install.

Holding Back Coal

IN BELGIAN and in German mines curtains of chains, wire netting and "coats of mail" are being hung from the roof to retard the running of coal in chutes and to prevent it from bounding down steep inclines in a manner dangerous to life and posts and injurious to the size of the coal. Such bounding coal makes a cloud of dust that jeopardizes health, if it does not also constitute an explosion hazard.

Gravity is a parlous transportation agent. At a low gradient, mine cars will run downhill; a slightly greater grade and the car can be made to slide, but with a little more inclination all security is lost. At a heavier grade, the coal will slide on plates without being pushed, but the happy mean between too steep and too easy a gradient covers so short a range that few workings are thus happily situated. A little less than the gradient needed, and the coal needs pushing; a little more, and it starts cascading. Belgians have found that the angle between 15 and 30 deg. can be bridged by the use of retarding curtains and loaded chains, permitting the use of a chute to keep the coal in place as it travels, and acting automatically to retard the coal in its travel, without actually stopping it whenever the requisite quantity is present to overcome the resistance. Anthracite will run on the bottom in gradients exceeding 25 deg., but some of it is likely to be diverted toward the gob.

Retarding devices, such as indicated, are better than methods of laying out the places so that the coal will switch back, once on its way down the excessive slope to the point of loading. Such devices might be used also to prevent rope-and-button conveyors from cascading. The idea is not wholly new. It has been used in the chutes of tipples, and in Cabin Creek old rubber tires were put to a similar use. But the idea has its value underground, as well as at the tipple, and more use should be made of it.

"A Good Press"

COMPLAINT that daily newspapers do not give the coal industry's side of disputes involving governmental or labor relations is perennial and, at times, bitter. Most of the responsibility for this situation, however, rests upon the industry itself. Coal operators as a class are notoriously reporter-shy, whereas government and labor officials long have made it a practice to take newspaper men into their confidence, because they have found that only in the rarest cases is that confidence betrayed.

The average reputable newspaper and the average reputable reporter desire to be fair and to give both sides of a controversy, if for no other reason than that the drama of conflict makes interesting reading. But this cannot be done unless both sides are willing to talk. The coal industry might well shed its reticence in contacts with the press with profit to itself and to the public.

NRA CODE MAKING

+ For Bituminous Coal Industry

Enters Into "Final" Stages

WASHINGTON, D. C., Sept. 12 — Bituminous code making, which has absorbed the attention of chief executives of producing companies throughout the country during the past three months, entered into what is promised to be the final "final" stages today. Following public hearings this afternoon on the flood of objections which greeted the terms of a code drafted by NRA last week as a substitute for the 30-odd codes and supplements submitted by different groups and individual companies in the industry, operators were asked to name committees to cooperate with NRA officials in reconciling the differences developed in the various codes so that Gen. Hugh S. Johnson, National Recovery Administrator, might be able to take a single "agreed" code to the White House for the Presidential signature. In the meantime, reports drifted in from the mining fields that workers were growing increasingly restive over the delay in promulgating a code and threatened further strikes.

Since the formal hearings on the original codes closed on Aug. 12, the situation has developed one crisis after another. Twice President Roosevelt has intervened—once to induce the non-union operators of the Appalachian region to enter into joint wage negotiations with representatives of the United Mine Workers and later to prevent the collapse of those negotiations when counsel for one of the groups of Southern operators expressed the opinion that a contract for exclusive employment of members of the union would run counter to the provisions of Section 7a of NIRA. Two days after this second intervention, an impatient display of temper by General Johnson so angered the Appalachian producers that many of them were ready to pack their grips and go home.

Only a hasty call to "The Four Horsemen" (the irreverant newspaper corridor conversation group designation for J. D. Francis, vice-president, Island Creek Coal Co.; J. D. A. Morrow, president, Pittsburgh Coal Co.; Charles O'Neill, vice-president, Peale, Peacock & Kerr, Inc.; and Ralph E. Taggart, vice-president, Stonega Coke & Coal Co., who have acted as the spokesmen for the Appalachian operators in every major development in the Washington situation) to come down to NRA headquarters and be placated by the general saved the day. The coal men declined to discuss what took place at this three-hour conference, but after it was over General Johnson admitted that the NRA code probably would be modified materially in a number of respects before it went to the President. Wage negotiations, which had been suspended following the release of the NRA code on Sept. 7, were resumed.

Sponsors for fourteen of the codes originally submitted appeared at the public hearings which started Aug. 9. Labor leaders, sociological workers and two Pennsylvania state officials also had their say during these hearings, presided over by Deputy Administrator Kenneth M. Simpson. The case for the joint code of the Northern Coal Control Association and the Smokeless and Appalachian Coal Association, representing producers in the Appalachian region outside of Alabama and southern Ohio, was presented by Mr. O'Neill and D. C. Kennedy, executive secretary, Kanawha Coal Operators' Association. As shown in the major code analysis published in the preceding issue of *Coal Age* (pp. 279-285), this code provided for base inside rates of $3.84 per 8-hour day for Ohio and Pennsylvania, $3.60 for northern West Virginia and $3.44 for the Southern mines.

Special emphasis was made in this presentation on the adequacy of the rates named and on the inroads competitive fuels had made and were making in the markets served by these coals. The suggestion of Donald Richberg, chief counsel for NRA, that this group mandatory clauses of Section 7a of withdraw provisions qualifying the NIRA was smilingly ignored. Strong objection was made against any code administration which would throw the Appalachian region with other districts. Proponents of this code also opposed giving the government veto power. A. B. Crichton, speaking for the Georges Creek and Upper Potomac mines, and J. S. Brennan, secretary, Somerset (Pennsylvania) Coal Operators' Association, subscribed to the general provisions of this code, but insisted that existing wage differentials in favor of their fields must be preserved. A similar plea was made by John F. Atkins and A. W. Hawley for operations in Preston County, West Virginia, for which a separate code had been filed.

The Rocky Mountain-Pacific group, said F. V. H. Collins, president, Bair-Collins Co., was content that existing wage rates in that area—the highest in the country—should continue. His group also was willing that the government exercise veto power in the administration of its code. During the

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Futile Delay

• This issue of *Coal Age* reaches its readers a few days late.

• At the time the September number was scheduled to close, there was every indication that the Bituminous Coal Industry Code of Fair Competition under NIRA would be ready for the signature of the President not later than Sept. 12. Accordingly, publication was delayed in the expectation that this issue might carry the full text of this code.

• Developments since Sept. 7, however, cast so much uncertainty on the situation that it seemed inadvisable to further delay publication of this issue of *Coal Age*, since latest reports from Washington indicate that it may be several days before the code is ready.—*The Editors.*

MAUMEE STRIPPING

+ Swells List of Operations

Using Modern Equipment and Methods

STRIPPING has rapidly moved into a recognized position as one of the major methods of mining coal in the flat country of the Middle West and Southwest, and as such has been showing a steady gain in recent years. One of the latest additions to the growing list of modern stripping projects is the No. 20 mine of the Maumee Collieries Co., located at Keller Station, on the Chicago, Milwaukee, St. Paul & Pacific Ry., ten miles south of Terre Haute, Ind.

Construction of the tracks and tipple was commenced in Sepember, 1932, and erection of the Marion 5480 electric stripping shovel with a 14-cu.yd. dipper, 100-ft. boom and 64-ft. dipper stick, was begun in November. The first coal was loaded on Jan. 3, and the normal output of 3,000 tons per day was reached in February. The seam being uncovered is the No. 5, and the five tracts to be operated contain from five to six million tons of coal. Thickness of the seam is approximately 5 ft., and it is overlaid by 30 to 50 ft. of hard, dense overburden made up of 2 to 7 ft. of black slate, a seam of limestone, shale and surface material. The limestone is absent over certain areas, in which case the black slate thickens to the maximum of 7 ft.

The working schedule adopted calls for the operation of the stripping shovel 24 hours per day. The coal-loading unit, a Marion 490 electric shovel with a 3¼-cu.yd. dipper, operates eight hours per day. Eight hours also is the schedule for the drilling units and the tipple, while the haulage equipment works 8½ hours per shift. The stripping plan is based on parallel cuts approximately 6,000 ft. long and 45 to 50 ft. wide, leaving a 15- to 20-ft. berm on which the track is carried. This means that any particular tract is opened up by a box cut 65 ft. wide, which is made by casting.

Two Loomis electric "Clipper" drills are used in preparing the overburden for digging. This work has been let to a contractor. Drillholes on 22- to 25-ft. centers are put down to within about 3 ft. of the coal, and are shot with 4x8-in. cartridges of 40 per cent dynamite. The overburden is then removed by the stripping unit, and the exposed coal is cleaned and shot for loading.

Cleaning at the new Maumee plant begins in the pit, and involves a variety of equipment for removing all the dirt left behind the stripping unit. The first step consists of the use of a caterpillar tractor and a "bulldozer" to take off the major part of the material. Workmen then go over the exposed coal with hand shovels, following this up with wire brushes to loosen any remaining dirt. The final step consists of blowing off the coal with compressed air.

Pneumatic drills are employed in preparing the coal for shooting, the air being supplied by a Schramm motor-driven portable compressor. This compressor also is used in blowing off the coal. The shotholes are drilled on centers of approximately 6 ft. and each hole is loaded with one stick of either pellet power or low-strength dynamite, depending upon whether or not there is a market for lump.

The haulage system is based on the use of standard-gage track laid with 90-lb. rails and the employment of railroad cars to carry the coal. Motive equipment consists of one 50-ton Pittsburgh rod locomotive and two 50-ton Heisler geared locomotives. Two of these locomotives are used in hauling from the pit to a storage yard, while the third serves the preparation plant. The standard train from the pit to the yard is made up of three 70-ton hopper cars. Construction of the storage yard was motivated by a desire to smooth out the flow of coal from the pit to the preparation plant.

In accordance with modern practice, the ground-cable system of supplying

General View of the No. 20 Operation of the Maumee Collieries Co., Showing Drilling, Stripping, Loading and Haulage.

14-Cu. Yd. Electric Stripper Plugged Into Oil Switch.

3¼-Cu. Yd. Electric Coal-Loading Unit at Work in the Pit.

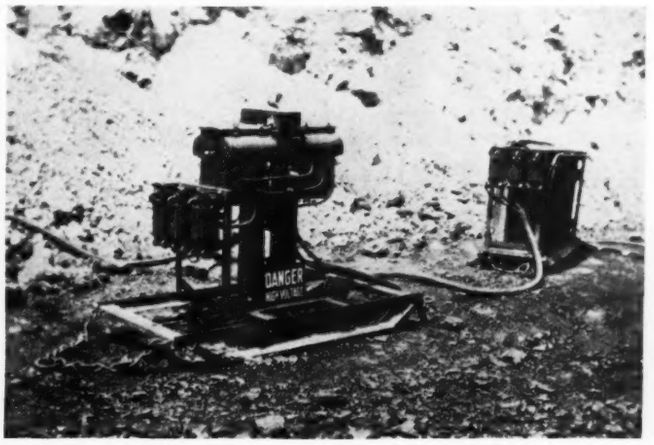
power to the working units in the pit is employed at the No. 20 stripping. Purchased power enters the property at a station near the tipple, which is equipped with four 500-kva., 33,000/4,400-volt transformers, one of which is held in reserve. From the main station, pole lines are carried to the tipple transformer station and the ground-cable connection at the storage yard, respectively. From the storage yard, the main ground cable, a three-conductor General Electric RHH cable (No. 1 conductors), is laid along the top of the bank paralleling the pit. Five junction boxes are inserted in the main cable at intervals of 900 ft., and from the junction boxes laterals, made up of G.E. three-conductor, all-rubber shielded cables (No. 1 conductors), are carried down the bank to the oil switches in the pit. The stripping and loading units are served from the respective pit switching stations by 1,000-ft. G.E. trailing cables. As the loading unit operates on 2,300 volts, a 4,600/2,300-volt transformer bank is inserted between the trailing cable and the switching station.

The junction boxes in the main cable are made of steel and are mounted on skids to facilitate moving them back as the work in the pit advances. Inside each junction box, connections are made to two Albert & J. M. Anderson Co. receptacles, one on each side. These accommodate the 100-amp. plugs on subsidiary cables. Ordinarily, only one receptacle is used, and that for connecting in the lateral leading away from the junction box, but the second receptacle is available, in case it is necessary to plug in auxiliary equipment, such as the blast drills and 15-hp. pump used to dewater the pit, which operates on 440 volts. An accompanying illustration shows a junction box and the transformer station with oil switch and cutouts which supplies the drills. This station and others of a similar nature, like the junction boxes, are mounted on skids to facilitate shifting them from place to place, and the use of skids is extended to the oil switches in the pit as well. Where there are no trees or other obstructions, the main ground cable is moved back by man power or tractor. In case this is not feasible, the company has provided a reel mounted on skids on which the cable is wound for transportation.

The coal is prepared in an all-steel tipple with eight loading tracks, which was designed by company engineers and erected by its own force. Railroad cars from the pit are dumped into a 110-ton bin. From this bin, the coal is carried up to the head of the shakers by a chain-and-flight conveyor. Capacity of the shakers is 5,000 tons in eight hours. Standard screening practice is based on the production of five primary sizes: 6-in. lump, 6x4-in. furnace lump, 4x2-in. egg, 2x1½-in. nut, and 1½-in. screenings, each of which is loaded out on a separate track. All sizes but the screenings are hand-picked, and the lump, furnace lump and egg are boom-loaded. The material removed from the feed to the picking tables includes an appreciable percentage of coal, which is recovered in a rotary breaker with 1½-in. openings and loaded out on the sixth track. While these 1½-in. screenings are of a lower grade than standard screenings, and are sold as such to purchasers who are able to use them, the output was sufficient to warrant installation of the breaker. In addition to the shaker screens, the plant also is provided with a vibrating screen for the production of

Junction Box at End of 5,400-Ft. Ground Cable With Laterals to Loading Unit and Drill Transformers Plugged In.

Oil Switches and 4,600/2,300-Volt Transformers Serving the Loading Unit From the Junction Box Shown at the Left.



Operating Force, Mine No. 20, Maumee Collieries Co., June 13, 1933

	Number	Hours per Shift	Man-Hours per Day
Stripping—First Shift:			
Engineers	1	8	8
Oilers	1	8	8
Groundmen	2	8	16
Stripping—Second Shift:			
Engineers	1	8	8
Oilers	1	8	8
Groundmen	2	8	16
Stripping—Third Shift:			
Engineers	1	8	8
Oilers	1	8	8
Groundmen	2	8	16
Blast Drills:			
Foremen	1	8	8
Helpers	4	8	32
Coal Shooting:			
Blasters	1	9½	9½
Coal Loading:			
Engineers	1	8	8
Oilers	1	8½	8½
Groundmen	1	8	8
Haulage:			
Engineers	3	8½	25½
Tripriders	3	8½	25½
Tracklaying:			
Foremen	1	8	8
Trackmen*	15	8	120
Preparation:			
Foremen	1	8	8
Oilers	1	8	8
Control men	1	8	8
Dumpers	2	8	16
Pickers	14	8	112
Flat trimmers	3	8	24
Miscellaneous Labor and Supervision:			
Blacksmiths	1	8	8
Pumpers	1	9	9
Teamsters	1	9	9
Water boys	1	8	8
Superintendents	1	8	8
Clerks	1	8	8
Night watchmen	1	8	8
Electricians	1	8	8
Total	70	..	591
Tipple operating time, hours			6
Tons shipped			2,667

*These men also available for drilling coal, moving equipment and general labor.

1½x¾-in. (No. 3) nut, 1½x⅜-in. stoker and similar junior sizes.

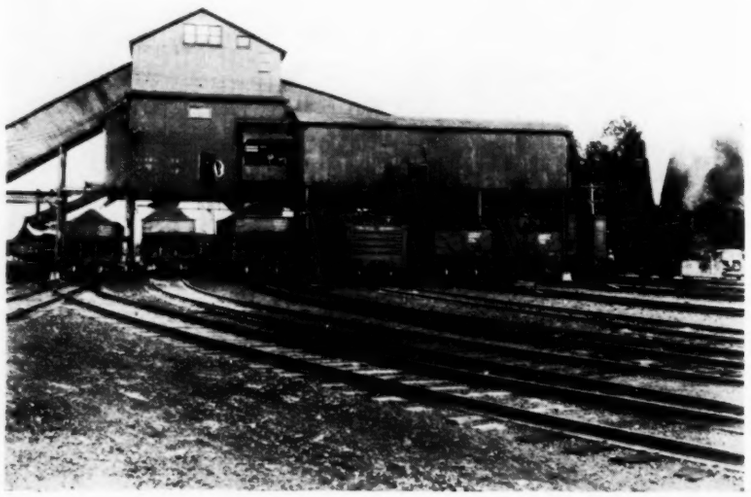
Through the installation of a mixing conveyor in a separate structure over the discharge ends of the loading booms, the company has made possible the shipment of a clean, hand-picked mine-run or any combination of the primary sizes which the customer may desire. Degradation screens are installed to remove breakage from all the prepared sizes before they are loaded. When the demand for lump slackens off, this size goes through the usual routine of hand-picking and loading over its respective boom, after which the railroad cars are shifted to the dump and the coal again is run through the plant after passing the crusher. By opening a gate in the chute leading to the shakers, the coal is diverted to the crusher set under the head of the chain and flight conveyor, after which it is passed over the screens.

To increase the flexibility of its shipping arrangement, the company in July started the installation of a Manierre box-car loader and an eighth loading track. The Manierre loader will handle various small sizes (nut and screenings) for the Northwest market. Its capacity is 1,000 tons in eight hours, and the coal will be brought to it by a 30-in. belt conveyor.

Junction Box Ready for Approaching Stripper to be Plugged In.

Junction of Pole Line and Ground Cable, Showing Lightning Arrester and Oil Switch.

Including supervisors and the blast-drill crews, the operating force at the No. 20 stripping on June 13, a typical day, totalled 70 men, classified as shown in the accompanying table. On that day, shipments totalled 2,667 tons, and man-hours totalled 591, making the average output per man-hour 4.5 tons. The stripping unit under normal conditions averages 12,000 to 15,000 cu.yd. every 24 hours, or 4,000 to 5,000 cu.yd. per shift. To date, the record for shipments in any one day stands at 3,285 tons. No. 20 coal is sold under the trade name "Maumee Chieftain," and moves to the following markets: Indiana, the Chicago district, and states to the north and west of Chicago. The company maintains sales offices in the following cities: Terre Haute and Indianapolis, Ind.; Madison and Milwaukee, Wis.; St. Paul, Minn.; and Waterloo, Iowa.



"Maumee Chieftain" Preparation Plant.

FACTORY METHODS

+ Bring Attendance at Nellis Mine Under Control of Management

By ELLSWORTH H. SHRIVER
Raleigh Coal & Coke Co.
Raleigh, W. Va.

DURING the past few years many articles have been written about coal-mine mechanization. Some of these articles have compared average coal-mine methods with those of well-operated and efficient factories. The coal mines did not fare very well in the comparison.

Everyone familiar with mining knows that the extraction of coal is essentially a destructive process. When the factory is located and constructed, it stays in one spot, clean, well lighted and safe in so far as the hazards of nature are concerned. Not so in a coal mine, where the working place of the miner is being moved forward constantly to a new location further underground and where overhead conditions are totally different from the protective roof of the factory building. The factory represents a creative industry, the mine a destructive one, making it impossible in a great many respects to apply the refinements common to all creative industries to mining. In two important particulars, however, a much closer approach to common factory methods may be attempted by the average mine manager with but little effort and expense. These are: (*a*) improvement in labor turnover and (*b*) elimination of irregular attendance.

The well-operated industry — steel manufacturing, for instance—considers a labor turnover of from 3 to 4 per cent per month a healthy condition. Over 4 per cent, on the other hand, is looked upon as an unjustifiable item of expense. With a turnover of from 35 to 50 per cent per month, which is the case at many operations even in these times of depression, coal mining makes a very poor showing.

Turnover usually is based on the total number of men leaving the employ of the company during any one month, less the number of men rehired who have been off the payroll for less than 30 days. This means, then, that at a mine with a turnover of 40 per cent, 40 new men out of every 100 at work each month must be trained to work properly in that particular mine. It is easy to see that excessive turnover is very expensive. Where this condition prevails, half the time of the foreman and his assistants must be spent in breaking in new men.

Some causes of turnover, such as the physical condition of the seam and lack of housing and school facilities, are entirely out of the hands of the operating management. Others, however, are subject to control by operating officials, such as providing the best possible working conditions, giving the miner an opportunity to make a decent living, and last, but not least, treating him fairly.

Irregular attendance can be traced to the beginning of the coal industry. The loader always has regarded himself as a contract, or piece, worker and has felt that it was *his* business if he wanted to loaf a day or two. The irregularity of day men has arisen largely from the same trend of thought. This condition has continued simply because mine management has permitted it to do so. The factory or steel-mill employee is expected to work every day the plant operates regardless of whether he is on the piece or day basis. This is largely a matter of training, and it is obvious, therefore, that regular attendance at a mine can be brought largely under the control of the operating management.

Turnover and irregular attendance are two of the most important items in any mine cost sheet, and while they cannot be isolated like loading or haulage costs, experience at the Nellis (W. Va.) mine of American Rolling Mill Co. (with which the writer formerly was associated) has shown that they can be controlled. This company's methods for reducing turnover and absenteeism were an outgrowth of a safety program adopted several years ago for the purpose of reducing accidents at its mining properties to the already favorable levels prevailing in its steel plants. With the safety idea implanted in the minds of all of its mine employees and with every man on the payroll trained in first aid to the injured, the company, in 1929, began to look for the real cause of accidents with the thought that if this could be determined, and the knowledge correctly applied, industrial accidents could be eliminated in so far as consistent with human frailty. It was finally concluded that inability to do a specific job correctly through lack of knowledge was the cause of the major part of industrial accidents.

With this idea in mind, courses in job training were developed for every man from the office janitor to the coal loader. Over a period of some months all employees went to school in small groups and were taught the proper way to do their particular jobs. As one result of this training, the mine was presented with the Joseph A. Holmes trophy in 1930 for being one of the safest operations in the United States. In addition, the problem of labor turnover was largely solved during the time when first-aid and job training were receiving a large part of the time and attention of the management. As the training, with its accompanying stiffening of job discipline, proceeded and as the management pressed its efforts to make the community a better place to live in, the urge to try the next place, which apparently is the heritage of all coal miners, began to disappear, and turnover decreased until it finally came within reasonable limits. This left the problem of irregular attendance. Here again, the management turned its attention to the underlying causes. It was felt that not only could accidents be reduced still further but that the monetary return from approximately

100-per cent attendance would more than pay the bill for accident prevention, job training and other work in connection with the program.

A time clock had been in use at Nellis for some time, although keeping time was not the primary purpose back of its installation. The men originally were checked in and out of the mine by the use of lamp checks, but it was thought that a supplementary system would be desirable, hence the clock. Time is turned in to the timekeeper by the various foremen the same as at most mines, and the clock cards are used simply as a check. They serve a very good purpose in settling any disputes as to shortages, which, by the way, are infrequent, due to the knowledge that they are used as a check.

Different colored cards are used for the different occupations, and the night-shift cards are different from those used during the day. The clock cards give the mine foreman a comprehensive idea of the daily situation at the beginning of the shift, when he needs it most. The number of loaders in any particular section of the mine or served by any given motor can be determined simply by counting the cards under this particular set of numbers.

The clock cards also have served another very useful purpose. Twice a year a representative of the U. S. Department of Labor makes a check on many mines in obtaining statistics as to hours worked and wages earned. On the arrival of this representative all that was necessary to do was to hand him the clock cards for the particular period in which he was interested, with the total earnings of each class of labor for that period, and all of the compilation work was done by him rather than the payroll clerk. The above is brought into the picture because the time clock plays an important part in what is to follow.

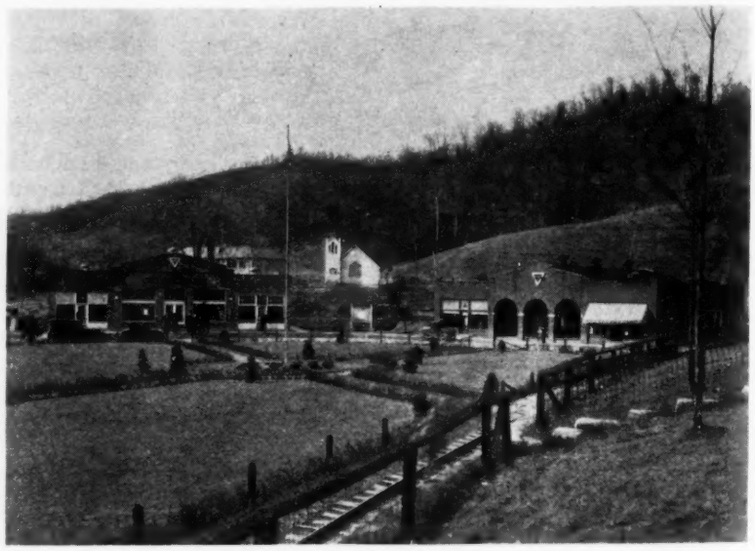
The average attendance of mine workers on the Chesapeake & Ohio Ry. system has been about 83 to 85 per cent for many years. It was a little better at Nellis, possibly due to the improved discipline growing out of the safety and job-training work. However, the record was far from what the management believed to be possible, so in the spring of 1930 it was decided to keep an accurate check on the attendance of every employee, this check to include the actual reason for non-attendance as far as feasible. A rule was adopted to the effect that every employee laying off for one day could return to work with the permission of the mine foreman, but that a statement from the company doctor covering his physical condition was necessary after an absence of more than one day. This rule eliminated most of the claims for compensation growing out of the concealment of accidents occurring while employees were off duty. Two sets of colored cards the same size as the standard clock card were printed, one set for the mine foreman and the other for the doctor, and the actual check on attendance began on April 1, 1930, continuing to the end of the year. Records were compiled weekly by the engineer, with the results set forth in the accompanying table.

Percentage of Non-Attendance, by Causes, Nellis Mine

Cause	Per Cent
Permission	17.70
Injury (able to work)	0.26
Injury (unable to work)	1.15
Stomach disorders	6.05
Colds and influenza	10.05
Eye ailments	0.53
General weakness	1.07
Headache	1.01
Pains and soreness	4.18
Boils	2.13
Rheumatism	3.17
Operations	3.99
Sickness in the family	18.85
Teeth	1.52
Tonsilitis	2.59
Intestinal troubles	5.61
Heart trouble	1.07
Appendicitis	0.45
Ear ailments	0.53
Sinus trouble (one case)	0.00
Rash	0.46
Bronchitis	1.33
Poison	0.26
Piles	0.72
Yellow jaundice	0.11
Miscellaneous	11.83
Injury (outside plant)	3.38
Total	100.00

One of the outstanding facts revealed by the study was that while injuries received in the plant caused the loss of only 16 man-days, three of which, according to the doctor's report, were unnecessary, a total of 1,108 man-days were lost through causes having no connection with accidents or injuries. In other words, the indirect cost of accidents represented only 1.141 per cent of the cost of non-attendance due to other causes. Of these latter causes "sickness in the family" was responsible for more non-attendance than any other item. In short, the study showed that sponsoring the county nurse, the employment of a community nurse and the work of the doctor in bettering living conditions for the miner's family through the development of proper sanitary measures, in addition to all the other things which go to make up the health of any community, were not misdirected efforts; that while safety work was important, education in the common rules of health and sanitation was even more so.

The most surprising result of the study, however, was the regularity of attendance that prevailed during the eight months, due to the fact that all employees knew that a close daily check was being made. In fact, attendance was comparable with that of any factory, and regularity was far better than anything which might be considered possible at any coal mine. The figures follow:



Nellis Community Center

Working each work day:	Per Cent
Loaders	96.26
Motor crews	96.89
Machinemen	98.14
Inside labor	98.21
Outside labor	98.40
Average, all classes	97.27

While the mine did not operate every day during the period the check was being made, the running time probably averaged more than 75 per cent. The part-time operation, no doubt, had some effect on the attendance, but not to the degree shown by the figures, which, as stated above, were the result of the close check made, as well as the trouble the miners were put to in getting back to work after laying off. They finally came to the conclusion that deliberate loafing was not worth the effort it took to return to their duties. The great majority of mines can improve their labor turnover, eliminate irregular attendance and develop a sense of job responsibility in their employees comparable with that of the average factory worker by the principles outlined in this article and by the intelligent use of that factory standby the time clock.

BETTER CLEANING

+ Plus Operating Economies

Feature West End Breaker

Refuse Loading Station and Incline

THAT the requirements of the anthracite market have yearly grown more stringent is so well known that it hardly bears repeating here. Nevertheless, these demands have been responsible for profound and still-continuing changes in anthracite preparation and preparation plants to meet and even anticipate the present and future requirements of the hard-coal consumer. Existing plants and equipment have been and are being modernized in accordance with present standards, and, in many cases, operating companies have found that new plants are the only solution to marketing and cost-reduction problems. Both of these factors figured in the construction of the new breaker of the West End Coal Co. at Mocanaqua, Pa., in 1932.

The new plant replaced an old wood-frame jig breaker located on the Susquehanna River at the extreme south end of the property. In addition to the inadequacies and high cost of the old plant, its location entailed long outside hauls in bringing the coal to the breaker. Study showed that a new plant located closer to the center of the property not only would make possible a high yield of prepared sizes, insure uniformity of product and offer a large capacity for a minimum expenditure, but would cut transportation cost and increase efficiency. In view of the undoubted advantages to be expected, the company decided to go ahead with the new plant. Construction work was started in November, 1931, and the plant, after a test run, was turned over to the operating company on April 5, 1932.

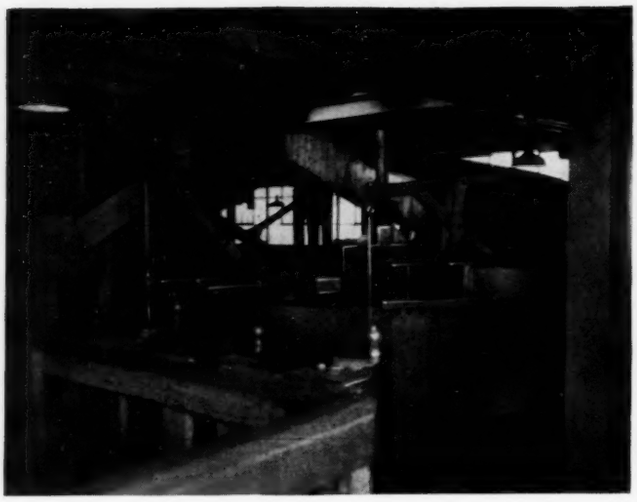
In addition to the plant proper, the construction program entailed the building of new railroad tracks, a refuse-disposal plant, offices, heating plant, substation, and other auxiliary facilities for a complete operating plant. The new location, however, offered ample space for storing coal during times of seasonal slackness, as well as improved railroad connections, an important factor in extending probable markets. Mine-car travel was reduced 800 car-miles per day, with attendant economies in operation.

West End Plant. Storage Pile and Top of Storage Incline Appear at the Right

Excluding facilities for refuse-disposal, the plant consists of three units: the dump house, including loaded and empty tracks, trip feeder, and trip maker; the roll house, in which are located the bull shaker, picking table, No. 1 rolls, broken shaker, No. 2 rolls, egg shaker, and the No. 3 rolls; and the breaker proper, including Chance cones for cleaning, desanding and sizing shakers, bins and loading equipment. By making the roll house a separate unit, it was possible to place the bull shaker, picking table, rolls and heavy shakers close to the ground, thus lightening the steel work in the breaker proper, lessening the cost of the mine-run conveyor and obviating the hoisting of refuse to the top of the breaker.

Coal and rock from the mine are dumped from the cars into a common hopper, which is equipped with a fly-gate to allow the operative to feed the contents either to the mine-run or refuse conveyor. From the dump house, the raw coal is carried to the roll house by a double chain-and-flight conveyor. On the bull shakers, the raw mine-run is separated into lump and steamboat, which go to the picking table, and smaller. From the roll house, the raw coal travels to the feed shakers in the breaker top, where it is separated into domestic and steam sizes. Coal smaller than barley goes to the waste-water flume. The domestic sizes (egg, stove, chestnut and pea) are chuted to a 15-ft. Chance cone for cleaning, while the buckwheat, rice and barley travel to twin 8-ft. rectangular-top cones.

From the domestic cone, the egg, stove, chestnut and pea go to a desanding shaker, and from there to the domestic sizing shakers. Desanding and sizing of the steam sizes is done on two fine-coal shakers without the interposition of a desanding screen. From the sizing screens, the various sizes go to the appropriate pockets. Domestic sizes are loaded over booms equipped with lip screens for removing degradation. One feature of the plant design



Domestic Cone at West End Breaker

Steam Desanding and Sizing Shakers

is that the coal travels forward from the time it is dumped until it reaches the railroad car; rehandling is avoided, except for the degradation product, which returns to the main breaker conveyor by gravity.

Average cleaning results at the West End plant are shown in Table I. In addition to the cleaning results proper, company officials point to a high degree of uniformity, and stress the fact that breakage and degradation have been reduced to a minimum. Float in the refuse averages 1.5 per cent for the domestic sizes (egg to pea, inclusive), and 2.0 per cent for the steam sizes. The number of cars condemned averages 15 per month. This includes all sizes.

Yard facilities consist of an empty yard with a capacity of 75 railroad cars and a loaded yard with a capacity of 40 cars. The latter has three tracks, one of which is for unconsigned cars; the other two are for cars routed over the respective railroads serving the plant. In addition, trackage at the old breaker will take care of 100 more loads. Grades are arranged for full gravity operation, and scales have been installed for weighing the cars both before and after loading. Retarders are used for positive control of all but box cars at the loading stations.

The railroad yard is arranged also for dumping condemned cars. Coal which fails to measure up to preparation standards is conveyed from a hopper beneath the tracks to the foot of the main breaker conveyor. An extension of the condemned-coal conveyor also serves, if necessary, to carry raw mine-run from railroad cars to the roll house. An additional dump has been installed below the breaker for storage coal, which is first loaded into railroad cars, then dropped down to the dumping point. From the dump, the coal is carried up an incline and chuted to the storage pile. Storage coal is reclaimed by a small steam shovel, which dumps it into a portable conveyor. The latter feeds onto a belt conveyor, which carries the coal to the foot of the main breaker conveyor.

The problem of a water supply was solved by damming a flume carrying mine water to create a reservoir with a capacity of 1,000,000 gal. As a safe-

(Turn to page 307)

Plant Layout and Flowsheet, West End Breaker

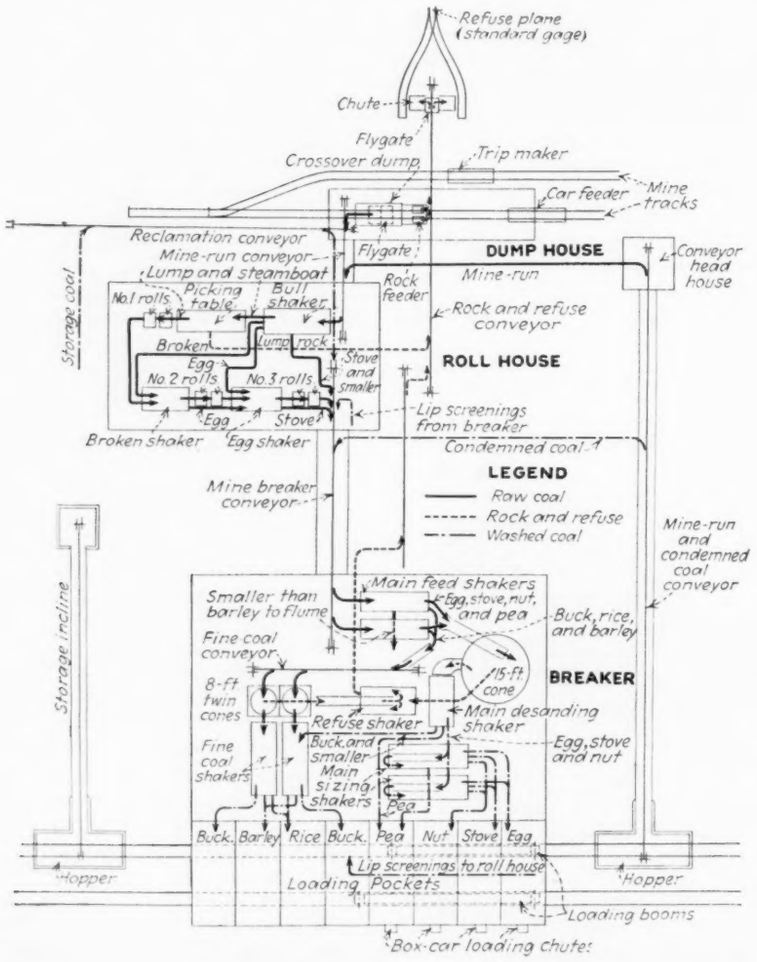


Table I—Average Cleaning Results at West End

	Slate, Per Cent	Bone, Per Cent	Ash, Per Cent
Egg	0.8	2.0	....
Stove	1.5	2.5	....
Chestnut	2.0	3.0	....
Pea	6.0		....
Buckwheat	6.0		10.0
Rice	6.8		11.7
Barley	8.8		11.0

UNIFORM DISTRIBUTION

+ Of Water an Important Factor

In Successful Jigging*

By BYRON M. BIRD

Chief Concentration Engineer
Battelle Memorial Institute
Columbus, Ohio

IN THE operation of a jig, unless the water is uniformly distributed over the screen, conditions will not be everywhere favorable to a clean separation. The control of water distribution involves two separate problems: one of distributing the water at right angles to the flow of coal in the bed and the other of distributing it parallel to the flow.

The first of these problems is found principally in jigs with plungers on one side or on one end. In this type of jig, an excess of the water tends to come through the section of the screen nearest the plungers. To overcome this tendency, fixed baffles are commonly placed beneath the screen, which deflect the water across the hutch compartment. Usually the openings between these can be varied only by nailing pieces of board partially over them.

Obviously this is a troublesome adjustment, because, in order to change the baffling, the operative must stop the jig, drain the tank, and then crawl into the hutch compartment. As many as a dozen trials may be required to correct conditions, and this means that the best adjustment rarely is obtained. Furthermore, even if some persistent operative finally gets an ideal distribution of water on the screen, it may need to be changed the following week because of some change in the character of the feed. For this reason, the regulation of water distribution is a constant source of annoyance and usually is far from ideal in jigs of this type.

The remedy for these difficulties is to make an arrangement by which the baffles may be adjusted without entering the jig. The baffles should be mounted on individual shafts which pass through the jig wall, and their angles of inclination should be adjusted by lever arms on the exterior of the hutch wall. Usually, the entire cost of installing the movable baffles is saved the first time an attempt is made to adjust the jig. This scheme is particularly valuable in the second compartments of two-compartment jigs, because in them bone has to be separated from coal, and the conditions must, accordingly, be under unusually accurate control at all times.

The second problem, that of getting water distribution parallel to the flow of coal, usually is completely regulated, in the case of the single-compartment plunger jig, by movable baffles, because as a rule the feed enters the jig in front of the plunger and flows away from it. But practically all other types, including basket jigs and two-compartment plunger jigs, have the second problem either alone or in combination with the first.

In one form, found in flat-screen jigs, the bed of refuse tends to build up at the feed end and to offer at that point an excessive resistance to the water. When this occurs, too much water flows through the screen at the overflow end. In many plants this condition has been overcome by introducing a baffle into the jig bed. Fig. 1 shows how this creates a condition much worse than that which the baffle is designed to correct. In this sketch the feed is correctly shown to be in an unseparated condition until it is beyond the baffle.

Any refuse bed that tends to form is, of course, scoured off by the passage of the raw coal. Furthermore, any water coming through the screen behind the baffle must escape beneath it along with the raw coal and thus the water washes away any refuse bed that may begin to form. Because a refuse bed cannot accumulate, the upward flow of the water finds little resistance beneath and in front of the baffle, and an excessive proportion comes through that part of the screen.

For this reason, the discharge end is left short of water, while the jig as a whole is using too much. As a result of this bad practice, not only is the distribution of the water unequal but, as is obvious, the first third of the screen area is not working effectively. This represents a loss of about one-third of the jig capacity or an equivalent proportion in the efficiency of the operation.

The first step in the solution of this adverse jigging condition is to raise the baffle until it dips perhaps 2 in. beneath the surface of the water. In this position it will assist in the wetting of the fine sizes, the only function for which it is adapted. The second step is to slope the screen toward the refuse draw at an angle such that the refuse will work forward more rapidly and equalize the resistance offered by the bed at all points. The refuse bed will then be only slightly deeper at the feed end than at the overflow end.

This ideal condition can be readily obtained in a separation where shale is the impurity to be removed and where the suction stroke is not too important a factor, but in most plants the screen plate should be set at a steeper slope, so that the thickness of the refuse bed will be uniform over the entire length of the screen. This is a condition which will aid the suction stroke in the cleaning of fine sizes.

But with a steeper slope, some supplementary means must be used to help equalize the water distribution. Adjustable baffles beneath the screen plate, in cases where they can be used, obviously will give ideal conditions. Another more generally applicable means of equalizing

*Third of a series of four articles on jigging.

the water is the use of a specially perforated plate in which the holes are so spaced as to equalize the water distribution. In one plate used at an Alabama plant in the washing of a minus 1-in. coal the percentage openings by 1-ft. intervals, read from the feed end toward the overflow end, are 7.1, 9.6, 12.1, 14.6, 17.1, 19.6 and 22.1 per cent, respectively; the average opening is 14.6 per cent. The low average percentage of opening

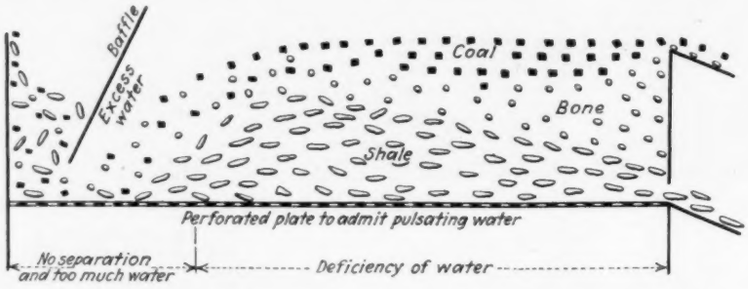


Fig. 1—Deep Baffle in Jig Bed Delays Separation, Makes Depth of Refuse Bed Unequal, Lowers Capacity and Destroys Efficiency

causes the water passing through each hole to form a small jet. These jets resist any tendency for one part of the bed to get too much water and also, in large measure, prevent plugging of the holes by pieces of hutch material.

The proper proportioning of plates of this type is a matter for experiment, but the plate just described will serve for a first trial in many plants. It should be sloped at first at about 1 in. to the foot toward the refuse draw, and then the feed end should be raised or lowered until the water distribution is almost uniform, with the bed a trifle more mobile at the feed end than at the discharge end.

After the jig is operating smoothly, the depth of the refuse bed can be determined. If it is much too shallow at the feed end, a new plate may need to be bored with a graduated percentage of openings such that the percentage at the feed end is higher; the plate can then be used at a lower angle of inclination. If the refuse bed is too deep, a new plate must be bored so that the percentage of openings at the feed end will be lower.

Another source of disturbance of the jig bed and therefore of the water distribution that occurs in the second compartments of two-cell jigs is the large volume of water flowing from the first compartment. Many schemes have been tried for overcoming this difficulty, but the best is one used by W. H. Coghill and C. O. Anderson in connection with jigging experiments on ore for the U. S. Bureau of Mines. No report has, thus far, been made describing this modification of the usual jigging system.

Fig. 2 shows a diagram of the arrangement as applied to jigging coal. This arrangement allows the coal and bone, once they have been stratified in the first compartment, to move forward into the second compartment with no restratification. Moreover, as the water in this arrangement flows smoothly across between compartments, it causes no disturbance. The two compartments are really a single long cell with facilities for withdrawing two different grades of refuse materials.

Obviously, this is a great improvement over the ordinary method where all the material from the first compartment has to be restratified in the second and where this useless work is done with the handicap of having the jig bed torn up by a large volume of water dropping into the compartment.

Several points in Fig. 2 should receive notice. First, the plungers in all compartments must rise and fall together; otherwise the coal will bank up on the overflow lip between compartments. This synchronism will make it necessary to equalize the load on the motors by the use of flywheels, by operating two jigs with the plungers set 180 deg. apart, or by some similar scheme. Second, the overflow lip between compartments should be perforated, and the water supply for it should be obtained from the second compartment. If care is taken of these two points, no difficulty will be experienced with the long-cell jig.

Certain fundamental conditions are necessary in jigging, and until these have been established as correctly as possible by visual examination of the jig operation, no object is served by wasting money on tests. But there comes a time in the jig adjustment when float-and-sink tests, screen-sizing tests and chemical analyses are necessary. Although there are many methods of doing this work, the secret of success in adjusting any washer is to find the nature of the incompletely separated material.

Suppose the ash content of the washed coal is too high. The proper procedure is to separate a sample of the washed coal in a series of heavy solutions so as to determine the nature of the refuse material that is contaminating the washed coal. Suppose it is fine shale or bone; the presence of either of these will point clearly to the need for more suction or for a more effective use of the suction provided. Suppose it is coarse bone; this has a number of possible significances. It may mean that stratifying conditions are not good; these should be carefully rechecked before anything else is done. It may mean that the jig is overloaded.

At this point the operative should carefully reconsider his speed and depth of jig bed to see whether they are ideal before cutting down on the tonnage washed. Suppose the impurity is "rash," a flaky material; this points clearly to larger perforations in the screen plate and possibly more suction. These examples will illustrate the method of study. The nature of the incompletely separated materials is the cue to the adjustment of the jig.

During this work the depth of refuse bed must be carefully watched to see that it does not vary. Before touching anything else, the operative should always assure himself on this point. Often a cycle of events will occur in setting a jig about as follows: The refuse bed will build up and the jig bed will cease to be mobile. The operative fails to notice that the refuse bed is too deep and turns on more water to loosen it up. Then he notices that the suction in the jig bed is gone. At this point he may even stop the jig and lengthen the stroke. Perhaps an hour later the refuse bed is too low and the whole system is upset and several hours may be required to readjust conditions. Meanwhile the ash content of the washed coal may be several per cent too high.

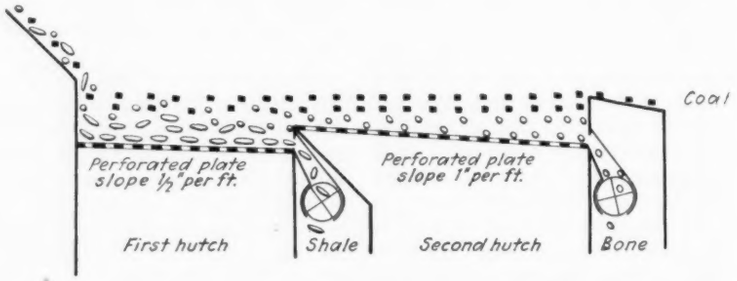


Fig. 2—Long-Cell Jig With Two Hutches. First Compartment Removes Shale and Second Compartment Eliminates Bone

(This series of articles will be concluded in an early issue of Coal Age)

BITUMINOUS COAL

+ Neither Plant Food Nor Fertilizer

By WILLIAM R. CHEDSEY

Professor of Mining
Pennsylvania State College
State College, Pa.

MINING literature occasionally makes reference to the use of coal as a fertilizer or aid in the growing of crops; one of the latest is a consular report from Germany: "Successful utilization of treated coal as a fertilizer is reported by the German Coal Research Institute of Mülheim, according to Trade Commissioner William T. Daugherty, Berlin. Experiments conducted by the institute are said to have shown the effectiveness of ground coal and lignite in plant life. The report also states that successful plant fertilization was accomplished by using mixtures of coal with soluble nitrogenous or potassium salts. It is believed, the report states, that such fertilizers may soon appear on the German market at a price range of about 25 to 30 marks per metric ton."

Earlier articles* attracted the attention of the Pittsburgh Coal Co., which, in consequence, made experiments on a plot of ground near Pittsburgh.

By using washery sludge, most of which would pass a 48-mesh screen, as a mulch or covering on top of the soil, the crop production on plots so treated was from 58 to 120 per cent greater than on adjoining plots not treated, the crops being wheat, oats and corn. A second year's experiment showed corresponding results with oats and corn, no experiments with wheat being made during that year. It was noted in these tests that the sludge, when plowed under or into the ground, did little or no good. The company then asked the Pennsylvania State College to interpret and continue these experiments. The department of agronomy of the Pennsylvania State College ran a carefully controlled experiment, under direct supervision of Prof. F. G. Merkle. The coal sludge received from the Pittsburgh Coal Co. was first subjected to a chemical analysis to determine its suitability for agricultural purposes, the results of which appear in Table I.

The notation of the department on the analysis was that it "shows no appreciable quantity of nutrient elements; in fact, a good surface soil may contain more." Its effect on certain biological processes, particularly nitrification, and its influence on soil acidity were then determined. These tests not only showed that the coal sludge had no value for these purposes but indicated that its influence was slightly detrimental.

Table I—Chemical Analysis of Sludge From Pittsburgh Coal Co.

Combustible matter	78.4	per cent
Ash	21.6	per cent
Total nitrogen	0.224	per cent
NH_3 nitrogen	none	
NO_3 nitrogen	none	
P_2O_5 soluble in 0.05 normal H_2SO_4	0.0225	per cent
P_2O_5 water-soluble	none	
P_2O_5 in ash	0.0234	per cent
SO_4	present	
Calcium, water-soluble	0.026	per cent

Next, experiments were made with soils and plants in pots under controlled temperature and moisture conditions; corn, tomatoes and beans being used. In this group of experiments, coal sludge sometimes was mixed with the soil in varying quantities and in other cases was placed loosely on the top of the soil to act as a mulch. Under all the temperature and moisture conditions tried, the plants showed slower and less exuberant growth when the sludge was mixed with the soil than in the controlling experiments where the soil was used without such admixture.

Where $\frac{3}{8}$ in. of coal sludge was used on top of the soil, the only effects apparent were a conservation of the moisture in the soil beneath the sludge and a very slight increase in temperature, resulting probably from the blackness of the coal sludge, which made the soil absorb more heat than it would have done if the surface had been of lighter color. The conclusions of the department from this series of experiments were that:

"A layer of sludge $\frac{3}{8}$ in. deep decreases the evaporation of moisture. From every other viewpoint, it does more harm than good. However, even if it were used on the surface as a moisture conserver it would be of value for only one year, as it would be necessary to plow it under in the following season, with resultant injury to the soil, as the tests have proved."

A further group of experiments was made in which corn, oats and tomatoes were planted on adjacent alternating areas of land treated with $\frac{1}{4}$ in. sludge as a top mulch, with $\frac{1}{8}$ in. sludge as top mulch, with sludge mixed with the soil, and with the soil entirely without coal treatment. The various treatments made no perceptible difference in the crop obtained, but the investigators expressed the opinion that if it had been an unusually dry season superior crops might have been expected on the sludge-covered soil, because the sludge would have conserved the moisture, as was demonstrated in the experiment already quoted.

The final conclusions of the department are stated as follows:

"1. The coal dust obtained from the Pittsburgh Coal Co. contained no appreciable quantity of any important plant nutrient.

"2. It tended to increase soil acidity slightly and to decrease nitrification.

"3. Used as a surface dressing or mixed into the soil, it tended to lower the temperature of the soil and delay germination.

"4. When used as a surface covering $\frac{1}{8}$ to $\frac{3}{8}$ in. deep, it decreased evaporation materially, hence in dry years it might increase the yield materially, while in moist years it might have no effect.

"5. After it has been used as a surface dressing, plowing and planting operations inevitably will incorporate it in the soil. As it has been shown that the product decreases nitrification and increases acidity, cumulative effect of its use year after year might be expected to be injurious.

"6. It does not inhibit weed growth; therefore it would not be feasible for use on any cultivated crop, because cultivation would mix it with the soil and nullify any possible mulching tendencies.

*"Coal Age, Vol. 30, pp. 288-289; *Coal Age*, Vol. 30, p. 308; and International Conference on Bituminous Coal, Transactions, 1926, pp. 592-594. An article on the experiments followed, *Coal Age*, September, 1929, pp. 531-533.

"7. Its use in plant production appears undesirable."

In a recent experiment conducted by the Tennessee Experiment Station, and reported in the annual report of that institution for 1931, p. 55, coal dust was applied in different experiments at the rate of 2 to 10 tons per acre on crops of corn, soy beans and millet. In any of the quantities used, it failed to increase the yields of any of the crops except millet, and that difference was within the limit of error. The average yields were as in Table II.

Table II—Crop Where Coal Was Used and Not Used

Crop	With Coal 5 Plots	No Coal 3 Plots
Millet hay	0.92 ton	0.83 ton
Soy beans	1.70 tons	1.68 tons
Corn stover	0.78 ton	0.79 ton
Corn grain	23.0 bushels	25.2 bushels

All these differences are within the limit of error. The coal dust was mixed with the soil to a depth of about 3 in.

The accuracy of the foregoing tests and experiments cannot be questioned, so only the following remote possibilities remain: First, that, in its action toward plants, the sludge tested is not representative of all parts of the coal seam; second, that coals from different seams may have a different action on plants; third, that freshly mined underground coal may act differently from coal which has been exposed to the weather for some time; and fourth, that the coal may affect cultivated plants differently from native or wild plants.

True, ammonium sulphate, a byproduct in the coking of coal, is used as a fertilizer, but that derivative does not occur as such in coal. The ammonia is produced in the byproduct coke oven by a rearrangement of elements in the coal at a high temperature. Some may say that, as wood ashes contain potash, a desirable plant food, this same potash should still be available in coal, as coal has been formed from wood. This apparently is not so, as the small quantity of potash present in coal is for most part so chemically combined as to be of no use as a plant food. The larger part of the potassium and calcium present in the original plant tissue was dissolved and carried away when the muck, which later became coal, lay under water.

Though it is difficult to see how there is any plant food in coal, some people still persist in their belief that coal may be of some value in agriculture, basing their conclusions not only on the German experiments quoted at the beginning of this article but also on the statement by Dr. Franz Fischer, at the International Conference on Bituminous Coal, reported in Transactions 1931, Vol. 2, page 809. He declared that: "In some few cited cases, coal when used in small quantities had a directly stimulating effect upon the growth of plants; larger quantities seemed to poison the soil."

Many undoubtedly recall seeing printed statements to this effect and possibly some have noted that vegetation, particularly sagebrush in the Rocky Mountain region, grows much more heavily on and below the outcrop of coal beds wherever the coal does not outcrop on cliffs too steep for vegetation. I have noted this phenomenon several times, particularly in northwestern Colorado and also in northern New Mexico.

In a personal communication, Meritt Hutton, chief engineer, Colorado & Utah Coal Co., Mt. Harris, Colo., states: "I have frequently noticed that the growth of vegetation along outcrops is heavier than in other places, and I used this as one of my guides in the location of outcrops. This difference may be due in part to the presence of coal in the soil, although I believe it is due largely to the fact that practically all the coal seams in that section being underlaid with clay, which is quite impervious to moisture, the ground water frequently follows these coal strata to the outcrop.

"For this reason, I have usually found much moisture along the outcrop; so much, indeed, in places as to form springs and boggy places. In general, I have found that the outcrops occur along a bench or somewhat level place on the hillside, and that usually above the outcrop the slope of the hill is of more than average steepness."

In the same communication, he also states: "Though I am unable to support my opinion with any definite information, it is my belief that the presence of decomposed coal in the soil stimulates the growth of vegetation."

All gardeners have a high regard for the growing qualities of "nice black soil," which contains, of course, much carbonaceous material from vegetation that has fallen on it and in cases been plowed under. Recalling that coal is vegetation which has been carried a few steps farther in its decomposition, it does not, at first, seem impossible that coal might have an effect when mixed with soil similar to that of the carbonaceous matter in "nice black soil," despite the fact that on rock dumps, where sandstone, slate and clay are mixed with carbonaceous matter, seldom is any vegetation to be found. However, in that case its absence might be explained by the fact that there is not enough soil on the waste pile to permit of vegetation or that the coal is of a type unsuited to plant growth.

It must be remembered that the carbonaceous matter in the black soil does not in itself stimulate plant growth. The action of vegetation is to increase bacterial action by which the decay of certain parts of the plants and the release of certain mineral plant foods are effected. The black carbonaceous matter remaining is largely humus and lignin, which in themselves play little or no part in future plant growth. Perhaps it would be well to state that the humus in normal soils forms a coating on the soil particles and granules and serves a physical rather than a chemical purpose. It is doubtful whether coal previously lignified and added as dust can fix itself on soil particles and bring about these physical effects.

Peat, the first stage in coal formation, does not seem to provide any plant stimulus, although no definite experimental results covering this are known. Certainly, vegetation is not heavier on peat deposits than on other rich soil. The use of peat and muck for soil amendment has generally given little or no promise, except when something is needed to increase the water-holding capacity of the soil and prevent excessive compacting, as on the putting greens of golf courses.

Brown coal, or lignite, the next stage in the formation of coals, contains a still larger percentage of lignin or nonactive carbonaceous material, and with the development of this stage the bacterial action which accompanies the release of humus and aids in plant growth has been practically completed. It is with this type of coal apparently that most of the German experiments in the use of coal for fertilizer have been made. It is difficult to see how any treatment coal may be given will induce further bacterial action after this stage has been reached.

In bituminous coal such as we mainly use in the United States, coalification has proceeded still farther, and the possibility of any part of the vegetal matter remaining which will serve as a plant food or stimulant with or without treatment is still more remote.

Those nutrients which plants draw through their roots are received in true solution. These include nitrogen as nitrates or ammonia, potassium, calcium, magnesium, phosphates and sulphates. Nitrogen in the form of nitrate performs a certain function in the soil stimulating plant growth and entering into the plant itself; it is probably the most important elemental plant food in the soil. The rest of the plant food is carbohydrate made in the plant itself from carbon dioxide taken in from the air and converted under the action of light. Many experiments have shown that carbonaceous matter in the soil will not substitute for the carbon dioxide in the atmosphere.

In conclusion, I think it might be safely said that, while many feel that natural weathered coal in soil promotes plant growth, all carefully controlled experiments indicate that bituminous coal or coals of higher rank have little or no value when used in quantities sufficient to afford the coal producer an additional market, the only exception indicated being that afforded by Dr. Fischer's statement, already quoted, regarding its use in small quantities. There is a remote possibility that by treating it in some way it might be made useful in agriculture, but, judging from its chemical composition, this surmise would seem very doubtful.

A 1½-MILE TUNNEL

+ Solves Haulage Problems

Of a Rocky Mountain Mine

WITH two seams of clean coal, each about 16 ft. thick, and with a roof of standstone of exceptional strength, the Kenilworth mine of the Independent Coal & Coke Co., at Kenilworth, near Price, Utah, has excellent opportunities for large and economical coal extraction, the only difficulty being that the seams pitch on an inclination of 9 or 10 per cent away from the original opening behind the tipple.

In the early days, the coal was opened by two mines. Coal from No. 1 mine was transported on the surface down two inclines, one leading to the other, the first being located on a rock shelf near the coal outcrop and being 1,600 ft. long, the second being 2,000 ft. long and having a drop to the tipple of 800 ft. This second incline, though bottomed solidly in rock for most of its length, nevertheless was so steep as to occasion much trouble from runaways.

No. 2 mine had a tunnel through the rock about 3,200 ft. long which intersected both seams. Coal was hauled through this tunnel by electric locomotive and dropped, by a hoist on the surface, a distance of about 2,400 ft., where two Shay locomotives picked up the cars and hauled them 4,800 ft. to another tipple.

The coal dipped so much that, after about nineteen years of operation, the lowest of the workings were already only a little over 100 ft. above the level of the tipple. It seemed needless, therefore, to lift the coal in both mines, when, by a tunnel driven through the hill, a road could be provided that would favor haulage and bring the coal to the tipple with a minimum expenditure of energy, make large tonnages possible, eliminate excessive separate handlings of cars and combine in one the production of the two mines. The site chosen inside No. 1 mine as the portal to the new tunnel was 534 ft. below the level of the original mine mouth. This will give an idea of the saving in transportation costs which the driving of the new tunnel effected.

In consequence, after careful study, a double-track tunnel was constructed 7,000 ft. long from its outer portal to its intersection with the lower coal bed. This tunnel was extended 1,200 ft. further, where it cut the upper coal bed. Excavation for this roadway was started from a point on the lower bed toward the surface and also from the surface inward. The tunnel cost from $19 to $23 a foot. Its roadway has an inclination of 1.75 per cent and leads to a surface track 1,950 ft. long which connects the end of the tunnel with the tipple. The gradient of this outside track is 2.5 per cent in favor of the load. Had the gradients been made any lighter, the tunnel would have had to be lengthened at both ends, especially at the far end. Any extension in that direction would have increased the length of the haul twice as much as the length of the extension, for all the coal lying above the tunnel, in that event, would have had to be hauled that distance north only to be hauled back south in the tunnel for an equal distance.

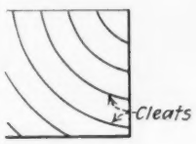


Fig. 1—Curved Cleats in Lower Half of Aberdeen Seam.

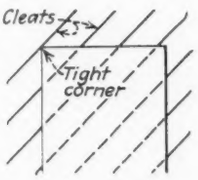


Fig. 2—Tight Corner in Entry Due to Driving at an Angle to Cleats.

This explains, probably, why lighter gradients on surface and underground tracks were not adopted. Such gradients would have located more coal to the rise of the tunnel and could have been made such as to equalize the resistance of empties and loads, but they would have lengthened the haul of much of the coal, increased the cost of the tunnel and delayed the desired cost reduction for many months.

The driving of the tunnel proved extremely well worth while. It restricted the duty of the inside hoists—the only hoists that remain—to the lowering of coal and the raising of supplies, making their function mainly that of retarding the movement of cars by brakes. Thus it greatly reduced the power bill. It eliminated the long incline which caused breakage of cars and endangered persons on and below the tipple, even those living in houses near its foot. It increased the output because the number of cars that could be lowered at any one time down the steep outside incline was necessarily limited. The new tunnel eases the problem of delivering supplies, which, however, is not and never was so difficult as at some mines, posts—usually the most important return freight of mine trips—being used at Kenilworth only in the withdrawal of pillars.

It also reduced delays. Before its completion cars were (1) assembled at the underground inclines by locomotives, (2) pulled up the steep inclines to the level of the mine mouth and (3) hauled thence by other locomotives to the mine portal. Then, at both Mines Nos. 1 and 2 there were two further handlings to the tipple. Thus, there were in all five separate handlings. Today, the coal is assembled underground by locomotives, dropped down inclines to the level of the tunnel and hauled by other locomotives direct to the tipple. There are, therefore, but three handlings, with their attendant delays and risks to life and limb.

The evenness of the tunnel gradient makes operation easy, for the cars float out of the tunnel without power; in fact, shoes and sand are used to keep the speed within limits. Other savings have been made by combining the tonnage of the two mines, one tipple serving both

mines, where two had to be operated under the original arrangement.

Kenilworth mine is in Carbon County, Utah, and located in the Book Cliffs Mountains. The measures are Triassic, the footprints of dinosaurs being visible in places in the roof of some of the mines and their bones being exposed at Como. In the Willow Creek Canyon, the coal was found to have been burned for a half mile from the crop. Perhaps the progress of the fire in that direction was favored by the fact that the cover was insufficient to prevent the ingress of air and the egress of incombustible gas, for under thin cover the overburden fractured and fell as the thick seams were consumed.

The top of the Mancos shale formation, a marine deposit, is found just below the entrance to the main tunnel. About 700 ft. above this shale may be found the lower coal seam, known as the Aberdeen, and 135 ft. higher the upper, or Kenilworth, seam. Both are 16 ft. thick and free from partings. Disregarding the Royal Blue seam, which is not worked and lies midway between the Kenilworth and Aberdeen seams, all the measures beneath the beds and above them are solid sandstones, which make a roof that in rooms and headings needs no support but which does not readily break and so constitutes, in pillar withdrawal, rather a difficult problem.

These coal beds, while truly stratified, exhibit, like most Western coals, no disposition to cleave along bedding planes. The breakage which occurs is mostly along the faces, which are not vertical or even straight. At the top of the lower 8 ft. of the seam, the beds cleave along faces that are nearer vertical than near the floor, but even at this upper point they lean backward at a considerable angle. Near the floor they approach but do not attain the horizontal. The change is not sudden, the top inclination graduating imperceptibly into the inclination at the bottom. The distance between cleats also is relatively short. In consequence the coal, like most Western coal, is not cubical but slabby. The coal as mined consequently has a certain fragility, due to the shape of the pieces which its mining produces.

In order to produce a maximum of large lump, the coal is worked on the face, but this is not the direction of the levels or of the inclines. The latter are driven north, straight down the pitch at a gradient of 9 or 10 per cent, and even occasionally 15 per cent. The levels are driven east and west. As the cleats run northwest and southeast, the rooms are driven southwest. They are, accordingly, 45 deg. off the levels and are at lower gradient than if driven up the pitch. This makes it possible to draw the cars out of the rooms by the same locomotives that handle them on the levels. It also reduces degradation and tight corners, because the rooms are driven directly on the cleats. The headings have tight courners, unfortunately, by reason of their being driven at an angle to the coal face.

Rooms and headings are driven closely on sights, thus assuring that the pillars will always be of full width. The former usually are made 24 ft. wide and 300 to 350 ft. long; at present they are driven in the lower half of the measure and only 8 ft. high. Pillars are 52 to 60 ft. across, and even more where it is believed that a wider pillar is desirable for roof support.

In the early days, because of the strength of the roof and its resistance to breakage, and because of the prodigality of the pioneer faced with the untold resources of nature, the pillars were rarely drawn, and the coal was taken the full height. Realizing the importance of having the pillars in good condition for their withdrawal, the coal is now taken only to the half seam, and pillar drawing and top-coal extraction follows immediately the completion of the room, the top coal being brought down and loaded as the pillars retreat.

Effort is being made to keep the workings closely superimposed, so that a pillar in the upper seam will lie directly over a pillar in the seam below, but it is difficult to determine how the locations of the pillars should be related where the seams lie on so steep a pitch as at Kenilworth mines. The workings in the upper seam are kept well ahead of those in the lower seam, that having been found the most reliable way of breaking the roof.

Pillars are drawn retreating from the outcrop, or from the limit of extension of working, and care is taken to maintain at all times a regular break line, which is carried forward across the headings from panel to panel—an important matter seeing that the roof breaks with such difficulty and is 1,200 to 1,500 ft. thick, with no soft clays or shales which by exudation or deformation would weaken the structure and let the roof down. The strength of the roof can best be judged by one place, 300 ft. long and 400 ft. wide, which has stood for years without a single prop, and also from the fact that headings are not timbered anywhere and yet are 13 to 14 ft. wide and standing without a fall.

In pillar drawing, large and solid pillars are split by roadways driven up their centers and made as wide as the strength of pillars will permit without crushing. Methods of attacking pillars depend on local conditions. With narrow pillars a crosscut is driven at the end connecting the face of the room with the face of the adjoining room. In large pillars cuts are driven through the pillar at intervals until the weight begins to show; then the coal is removed in steps. The top always is kept shot up to the face of the pillar, no overhanging brows being left. Props are kept up to this face line and drawn only so fast as to throw a proper weight on the pillar.

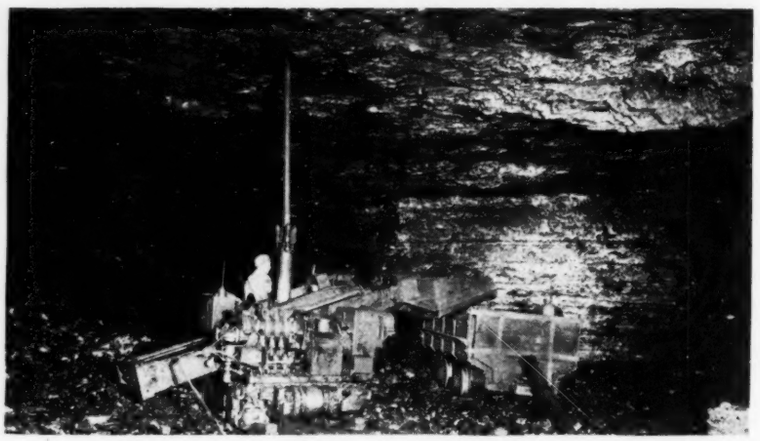


Fig. 3—Loading Coal in Kenilworth Mine With Electro-hydraulic Shovel.

The seam is undercut in the bottom coal to a depth of 6 to 7 ft. The cutters go in after lunch, examine the face for gas with a flame safety lamp and cut the places as they are cleaned up. Much emphasis is laid on the careful cleaning of the undercut with a long-handled shovel and shoveling back the dust before shooting, so as to prevent stirring up the dust by a windy shot or by one venting itself through a crevice. Water is used on the cutter bar to keep down dust.

On each cutting machine is carried an electric drill, which is not, however, mounted on the machine. Sometimes the cutters drill the holes after the coal is cut, but in some cases the drilling is done by men assigned to that work. The number of holes is varied according to conditions. Permissible powder, equivalent in strength to 40 per cent dynamite, is used for loading the holes. These charges are inserted and tamped by shotfirers; the charges are fired between 7 and 8 p.m.

All the dummy cartridges used in the mine are made by a boy who throws

switches and attends the telephone on the inner end of the tunnel. Without the assistance of a machine he can make 1,400 dummies a day, using the blue Mancos clay shale from a point near the mouth of the mine. Some he makes dry, but others, which are used to blow down the top coal after the pillar has been brought back a few feet, he makes out of clay so wet that it will ball in the hand. These top-coal holes are drilled at an angle of 45 deg. to the horizontal, and if the clay in them is not stiff, it will fall out as it is being tamped.

In every case, the shotfirers explode the charges after everyone except they themselves and the inspectors have left the mine and deposited their checks in the lamp cabin. In consequence, it may be necessary to wait as much as an hour before the last belated man turns in his check, but no matter how long the wait no shots are fired till the word is sent over the telephone that "all is clear." Prior to shooting, each place is inspected for gas. Shots are made from headings and crosscuts, and not, as is so usual in Utah, from outside the mine. This insures that the inspection will not be made so long before the shot that gas can accumulate meanwhile. All the shots in a place are fired by the same current, but only one place is shot at a time. After each shot, the shotfirers examine the place to see if the shot is effective and to note if the coal has caught fire, the latter even though it has been found that, when the coal is shot with permissible powder, fires in the coal never occur.

Though the mine usually is rated as gaseous, months usually go by without the appearance of gas. The practice is to operate the mine as if it were dangerously gassy, all precautions being taken to avoid an ignition.

When the mine is running on a normal schedule, about 50 per cent of the coal is loaded mechanically by six Goodman electro-hydraulic power shovels, each of which produces, on an average, about 200 tons per shift. The track is laid on the lower side of the room to allow a down movement of the loaded scoop. Each scoop of the shovel lifts about a ton. A full crew consists of one faceman, one shovel runner, one shovel helper and two men on the gathering locomotive, which may be a 6-, 8- or 10-ton Goodman or General Electric flame-proof reel unit. Thus the output is roughly 40 tons per man-shift.

Main transportation is provided by 15-ton trolley locomotives, each of which pulls a 24- or 32-car trip. In all, there are 28 miles of track in headings, rooms and tunnels with rail weights of from 25 to 75 lb. per yard. Different types of cars are in use, ranging up to 5 tons capacity. The company will standardize on copper-steel cars with bottoms of the same type, Timken bearings, spring bumpers, no brakes, with a capacity of 5 tons, the bearings being fed with grease from a power grease gun.

As in most mines in the West, the lack of water rather than its plenitude is the great problem. Most of the mine water is used for sprinkling cutter bars and loaded cars, but a little remains for watering the lawns around Kenilworth village. Ventilation is hardly a problem, the headings being so high and wide and never falling in except near the pillar breaklines. A 5x11-ft. Jeffrey reversible exhaust fan at No. 1 mine furnishes 110,000 cu.ft. of air per minute at a water gage of only 0.9 in. A 3x7-ft. Jeffrey reversible exhaust fan at No. 2 mine furnishes 120,000 cu.ft. of air with a 1.1-in. water gage.

Rock dust on every rib and on the sides of every room, and water sprayed on cutter bars, face and loaded coal keep the mine free from explosions. A well provided mine-rescue station guards against the time—as yet fortunately unarrived and unexpected—when such protection may be needed.

▼

Better Cleaning Plus Operating Economies Feature West End Breaker

(Concluded from page 300)

guard in case of failure of the mine supply, a pumping plant also was installed on the Susquehanna River, one mile away. This station is connected with the reservoir by an 18-in. wood pipe line. Water is pumped to the breaker by a 5,000-g.p.m. centrifugal pump. After the water passes through the breaker, it is run into a settling tank and the overflow returned to sump.

To serve the new plant, an 875-kva. transformer station was installed for stepping the voltage down from 13,200 to 440. Unit drives are standard, and the control system is interlocked so that when any piece of equipment is shut down, all other units back to the dump are stopped automatically. Slip-ring motors are in the majority, though the breaker pump has been equipped with a 500-hp. synchronous motor for power-factor improvement. Motor equipment is listed in Table II.

A boiler plant was installed for heating the breaker, roll house and auxiliary buildings. One 150-hp. boiler already is in use, and space has been provided for a second unit if it should be necessary. The breaker and roll house are heated with York unit heaters. Other buildings employ direct radiation with low-pressure steam. Flexible rubber pipe is used to carry sand and circulating water to the cones, and pump fittings are rubber-lined to reduce wear.

Refuse disposal at the West End plant has been designed to eliminate the usual rock pocket. Instead, two larries receive the coal at the rock conveyor discharge station. By means of a flygate and chutes, one larry is loaded without stopping the conveyor while the other is on the way to the dump. Larries, when loaded, are hoisted up a 15 per cent grade, and are then allowed to roll down a 3 per cent grade to the edge of the fill, where they are dumped automatically.

The average output of the West End breaker is 1,700 gross tons of cleaned coal and 600 gross tons of rock and refuse per shift of 8 hours. The total breaker force, excluding the coal inspector, comprises 31 men, as shown in Table III. The plant was designed by the Chance Coal Cleaner organization. Stuart, James & Cooke, Inc., offered consulting service and erected the plant.

Table II—Motor Equipment, West End Breaker

Duty	Horsepower
Car feeder	25
Trip maker	10
Gate motor	1
Rock pusher	15
Roll motor	75
Mine-run conveyor	75
Bull shaker	30
Main breaker conveyor	100
Feed shaker	50
No. 4 rolls	40
15-ft. cone	50
8-ft. cones	50
Desanding shaker	40
Domestic shakers	50
Steam shakers	30
Loading booms	1
Car retarders	1
Refuse shakers	15
Refuse conveyor	75
Compressor (slate gates)	50
River pumps	300
Breaker water pump	500
Sand pump	25
Sand conveyor	3
10-in. circulating pump	50
6-in. circulating pump	30
Sump pump	15
Condemned-coal conveyor	75
Storage coal incline	40
Reclamation conveyor, storage coal	25

Table III—West End Breaker Force, Day Shift

Classification	No. Men Employed	Man-Hours
R.R. car loaders	2	17.0
R.R. car runners		25.5
R.R. car cleaners	1	8.5
Pickers	4	34.0
Cone attendants	2	17.0
Shaker attendants	3	25.5
Breaker refuse engineers	1	8.5
Larry operatives	1	8.5
Headmen	1	8.5
Footmen	1	8.5
Dump house:		
Ticket takers	1	8.5
Latch knockers	1	8.5
Switch throwers	1	8.5
Refuse line and roll attendants	1	8.5
Roll house attendants	1	8.5
Rock inspectors	1	8.5
Breaker cleaners	1	8.5
Breaker watchmen and firemen	1	8.5
Breaker pumpmen	1	8.5
Breaker repairmen	2	17.0
Total	31	255.0

NOTES

. . . from Across the Sea

SUGGESTION was made recently in this department that bituminous coal in the raw might, some time, be converted into a plastic, for it is well known that while semi-bituminous coal and some semi-anthracite are quite friable, anthracite, which is derived from them, is an extremely hard material. Apparently, the anthracite of today was at one time incoherent material capable of being hardened which was converted into its present condition by pressure and heat. Bakelite is made from wood meal, phenol (C_6H_5OH) or cresol ($CH_3C_6H_4OH$) and formaldehyde ($H.CHO$) by subjecting them to a temperature between 300 and 360 deg. F. and a pressure between 1,500 and 5,000 lb. per square inch. There are, of course, a large number of other plastics —cellulose base plastic, such as pyroxylin, which is used for film and in safety glass; celluloid-acetate plastics, used for incombustible film; urea-formaldehyde plastics; glycerine-phthalic anhydride plastics, styrol, vinyl and casein plastics, cold-molded plastics, and plastics with a rubber base (plioform). Various fillers are used such as wood meal, fibers and asbestos.

The industry is a large one, the products in the United States alone running into thousands of tons and even having in Great Britain a technical publication of its own named *British Plastics.* Phenol-type plastics are used for molded furniture, beds, interior trim, building materials, vehicle bodies, hardware, small machines, trays, stoppers and many other articles. They are especially in favor for electric insulation. Phenols and cresols for this purpose were derived originally from the distillation of coal in high- and low-temperature ovens for the making of coke, gas and low-temperature distillation products, but synthetic phenols are now being manufactured and are driving hard against the phenols manufactured from coal.

In a German publication, *Brennstoff-Chemie,* recently appeared a report of an address by Franz Fischer before the Kaiser Wilhelm Institute für Kohlenforschung at Mullheim-Ruhr. The researches are made by Dr. Fischer in collaboration with Otto Horn and Hans Küster. Dr. Fischer declares that lignin had repeatedly been suggested as a basis for artificial resins and that the close relationship of lignin with peat, brown coal and true coal, all of which contain lignin, had indicated that perhaps these latter might be used to form the basis for plastics. By finding the quantity of residue unattacked by hydrolysis with 72-per cent sulphuric acid the quantity of lignin in various substances was ascertained. Table I shows the figures obtained in these studies.

Table I—Quantity of Lignin in Various Substances

Material	Per Cent
Linden wood	22.0
Birch wood	23.8
Oak wood	25.2
Beech wood	25.6
Pine wood	26.6
Nut shells	36.8
Türnich lignite	66.4
Fortuna lignite	68.6
Neurath lignite	88.1
Marienburg lignite	92.8

Lignin dissolves readily in phenols, especially in the presence of strong acids, said Dr. Fischer, and it has been found that when coals are warmed with phenols they swell and can be brought into solution. Dr. Fischer experimented with cellulose, lignin, sawdust, peat, brown coals, lignites, humic acids and ordinary coals, digesting the carbonaceous material with an excess of phenol, causing the excess to be sucked away, and washing the product with benzol.

It was found desirable to grind the fine coal and dry it in a vacuum, digest it at about 176 deg. F. for several hours in a mixing machine with about 12 per cent of technical cresol (a mixture of isomerides, preferably dissolved in a volatile solvent). Lignin and lignitic brown coal gave the best results. During digestion these two materials swelled to about twice their original volume. The heating completed, the solvent was removed by distillation in a vacuum and the mass obtained was molded in a hydraulic press at 4,267 lb. per square inch and at a temperature of 302 deg. F.

Carbolic acid and various crude mixtures of phenols and cresols will serve as well as cresol, but not compounds in which the phenolic hydroxyl group is substituted as in phenetol ($C_6H_5OC_2H_5$) or anisol ($C_6H_5OCH_3$). The molded products from these compounds were even more brittle than those made from lignite alone or from lignite mixed with glycerine ($C_3H_5(OH)_3$), paraffin, glycol ($C_2H_4(OH_2)$), etc. In contrast, organic bases, such as aniline ($C_6H_5NH_2$), naphthylamine ($C_{10}H_7NH_2$), pyridine (C_5H_5N), piperidine ($C_5H_{11}N$) and quinoline (C_9H_7N), usually were found to afford excellent results both with lignin and lignitic brown coal.

The coal constituents may pass into solution unaltered, but probably they combine with the phenol or base with a reaction that is intermediate between a true chemical union and absorption, for they have only a slight odor and after heating for a long time at 212 deg. F. in a press they are quite odorless and lose no weight. Products molded from pyridine are entirely free of odor. However, it is clear that a part of the cresol or base is not in a firm state of combination, for a portion of the volatile component can be removed by distilling the powdered mass by steam.

A firmer chemical combination might have been produced by the use of condensing agents, such as strong acids, but this might have injured the electric insulation qualities of the products.

Of course, the results with lignite and cresol, excellent as they are, might be improved with further experience. Tests were made at higher pressures than 4,266 lb. per square inch and it was found that the impact bending strength reached its maximum when the pressure of molding was 12,800 lb. per square inch, and decreased thereafter. Though the molded articles have a hard surface, they can be filed, sawn, drilled, turned and highly polished even when sawn. They are quite unaffected by atmospheric conditions.

The material has been dubbed Kolinite. It is a product probably more highly dielectric than Bakelite itself. A rod of the latter if held in the hand will lose the charge which friction will give it, but the Kolinite rod will retain it, as can be shown by an electroscope.

Table II—Impact Bending Tests on Rods of Plastic Material

Mix	Lb. per Sq. In.
Lignite without addition	64
Lignite with 5 per cent of cresol	74
Lignite with 7.5 per cent of cresol	70
Lignite with 10 per cent of cresol	64
Lignite with 12.5 per cent of cresol	107
Lignite with 15 per cent of cresol	87
Lignite with 17.5 per cent of cresol	75
Bakelite, rapid pressing mixture S	71
Phenol-formaldehyde mass S	131

Perhaps this further thought may be pardoned: Seeing that developed coals contain phenolic bodies, perhaps such coal would give results without the addition of phenol or cresol, or with less of it, though Fischer's experiments with bituminous coals seemed less favorable than with brown coal. What would happen if lignite and bituminous or semi-bituminous coal were mixed and treated? It will be noted that in the making of Kolinite, formaldehyde and furfural ($C_4H_3O.CHO$) are not used.

The presence of actual veins of anthracite traversing the rock between beds of anthracite, though extremely rare, and the thickening of such beds where intense folding took place, suggest that the bituminous coal from which anthracite was formed by pressure became, at least in places, a viscous fluid, or a semi-solid, capable of moving in volume from a point of pressure to one of release. Some of the distortions

of the anthracite beds may not have been due to peat flow but to an action on a more highly developed material made fluid by its own internal reactions and heat.

Geologists assert that Pennsylvania suffered many peneplanations after the coal was laid down, and that the folding was not coeval with the Carboniferous era. How then does it come that the coal is not found crushed? Doubtless because the coal beds were reknit by the binding action of the resins in the coal.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Requests for U. S. Bureau of Mines publications should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C., accompanied by cash or money order; stamps and personal checks not accepted. Orders for other books and pamphlets reviewed in this department should be addressed to the individual publishers, as shown, whose name and address in each case is in the review notice.

The Ashland Coal Field, Rosebud, Powder River and Custer Counties, Montana, by N. W. Bass. U. S. Geological Survey, Bulletin 831-B, 105 pp.

On the east and west banks of the Tongue River, as it makes its way from Sheridan to Miles City to join the Yellowstone River, is the Ashland coal field, described in this bulletin. The field lies to the east of Colstrip from 3 to 50 miles. There are more than seventeen seams and an estimated resource of almost eleven billion tons of coal, most of it in five beds with local names, all in the Tongue River member of the Fort Union formation, which is an Eocene measure. All the coal occurs in about 875 ft. of strata. Everywhere the outcrops are burned, forming a hard slag or porcellanite. Beds 20 to 25 ft. thick occur and persist at that thickness over areas of several square miles. Outcrops of coal beds 10 ft. thick are common. No analyses of the coal are given.

* * *

Comparison of Small- and Large-Scale Experimental Carbonizing Apparatus, by A. C. Fieldner, J. D. Davis, E. B. Kester, W. A. Selvig, D. A. Reynolds and F. W. Jung. U. S. Bureau of Mines, Technical Paper 543; pp. 33. Price, 5c.

Efforts have been, and are being, made to devise small-scale carbonizing ovens that will enable designers to prognosticate the success of a large plant in carbonizing any given coal, but without entire success. This technical paper shows how the results of carbonization with the 85-lb. retort of the U. S. Bureau of Mines carbonizing at 900 to 1,000 deg. compares with those obtained with a 2-ton oven of the Canadian Department of Mines, a Koppers coke oven of the Winnipeg Electric Co., the United States Steel Corporation's high-temperature oven and the British Fuel Research Board oven. Two coals were taken, one from the Michel mine, Michel, B. C., Canada, with about 28 per cent of volatile matter and 1.9 per cent moisture, and one from the Pittsburgh bed at Allison, Fayette County, Pennsylvania, with about 33 per cent of volatile matter and 3.1 per cent of moisture.

Taking the Allison coal, the Bureau of Mines retort showed 71.0 per cent of coke; the Canadian 2-ton oven, 69.2 per cent, and the Koppers oven 70.6 per cent, the last being for wet coal to wet coke, moisture content not being available. The retort gave a shatter test of 28.4; the 2-ton oven, one of 45.0; and the Koppers oven, one of 53.0. Gas compared more favorably, namely 10,650, 10,819 and 11,732 cu.ft.; with B.t.u. per pound of coal, 3,105, 3,048 and 3,000; and tar in gallons per ton 13.9, 12.2 and 12.2. All of which shows that perfection has not been reached, though the thermal values of the gas are not too divergent. Moreover, the coke percentages of the Michel coal were more disconcerting than with the Allison coal; namely, 74.5, 73.3 and 80.0, the last figure being, however, wet coal to wet coke with moisture content not available, as in the Allison case.—

* * *

Rubber-Sheathed Trailing Cables, by L. C. Ilsley, A. B. Hooker and E. J. Coggeshall. Bulletin 358, U. S. Bureau of Mines; 53 pp. Price, 25c.

Commencing with a study of the various kinds of trailing cables, this report gives intimate details of 30 concentric cables, 33 twin cables and 12 triplex and twisted duplex cables. Tests, in which a 7-ton car running on steel rails passed over a clamped cable, showed that the best concentric duplex cable tested failed in 70 per cent, the best twisted duplex cable failed in 40 per cent, the best triplex cable in 10 per cent of the tests, and that the best twin cable never failed. When a twin cable is crushed, it fails by grounding, not by a short-circuit. Twin-type cables, say the authors, can be made with little or no added cost, and no appreciable increase in size, to meet an arbitrary crushing test that assures much greater safety and life performance than is given by cables now in general use.

Much cable, the report points out, is ruined or its probable life shortened by being overheated in service. When a cable is off its reel, it does not heat so much as when on it and cools more rapidly. Thus one unreeled conductor in 40 minutes rose in temperature from 70 to 125 deg. F., and then, being allowed to cool, returned to 70 deg. in 37 minutes. A portion of a conductor which was coiled in five layers on a reel rose in 40 minutes to 220 deg. F. and was still rising at the end of that time. After 3 hours 50 minutes the temperature had fallen, it is true, but was still 145 deg. F. Splicing, temporary and permanent, receives much attention in the bulletin, also tearing of cable coverings, reeling and kinking. A list of recommended cables is given. The Bureau notes continuous progress since 1925, when the first tests were made.

* * *

First Aid at Mines. (British) Mines Department, Safety Pamphlet No. 7. British Library of Information, New York City. 19 pp. Price, 10c.

Described as "notes to help mine managements and mine workers in some details of the organization of a good first-aid and ambulance service," this book cannot be expected to map any elaborately new methods of attack, but doubtless it will be found interesting and helpful, though it mingles legal requirements with others, as is to be expected in a Mines Department publication. Closing pages give the general regulations of the (British) Board of Trade of Feb. 11, 1930.

* * *

Heat Transfer From a Gas Stream to a Bed of Broken Solids, by C. C. Furnas. U. S. Bureau of Mines, Bulletin 361; 88 pp. Price, 10c.

Studies of the transfer of convective heat to solid bodies are fundamental to operation of all forms of heating apparatus and, therefore, to all producers of fuel. This publication has reference only to one phase: the transmission of heat to broken solids. In domestic furnaces for anthracite, perhaps it might be permissible to exchange passes for a bed of solids that would absorb convective heat and radiate it, though often little of that heat remains after it has passed through the unignited coal above the burning zone. The study of Mr. Furnas might be applied to heat from this top coal. There are many other applications, as the author himself declares in his introduction—blast furnaces, boiler-fuel beds, gas-producer beds, water-gas generator beds, dry coke quenchers, cupolas, limekilns, furnace regenerators, still columns, sinterers and ceramic kilns. As the results are mostly curves and formulas, appalling to those not of mathematical bent, no brief of the results will be attempted.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

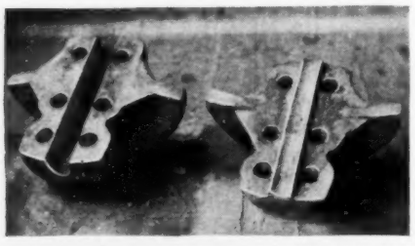
■

Experience Guides Improvements On Button Conveyor

With a capacity of 360 tons per hour at a maximum speed of 155 ft. per minute, which makes it one of the largest installations of its type in the country, the rope-and-button conveyor at one of the major southern West Virginia mines represents the solution of a number of operating problems growing out of its unusual size and capacity. Present speed represents an increase over the speed of 90 ft. per minute for which the equipment was originally designed. Length is 1,487 ft. on a constant pitch of 32 deg., and the rope size is $1\frac{3}{8}$ in. The conveyor is driven, or rather retarded, by a 100-hp. motor.

One problem which came up after its installation was slippage of the intermediate buttons along the rope, due to the relatively heavy coal load. The original solution for this problem was based on wrapping the rope under each button with sheet copper. This was forced into the rope when the button was bolted on, and furnished some measure of protection against slippage. Flattening of the rope, due to the clamping action of the buttons, was still to be overcome, however, and this problem was met by a new design of button, shown in the accompanying illustration. The parallel ridges on the one half of the button fit down into the rope channel in the other half, thus clasping the rope firmly around its entire circumference and preventing flattening. The improved grip obtained with this button also obviates the use of sheet copper to prevent slippage, as well as the possibility of electrolytic action between the copper and the rope.

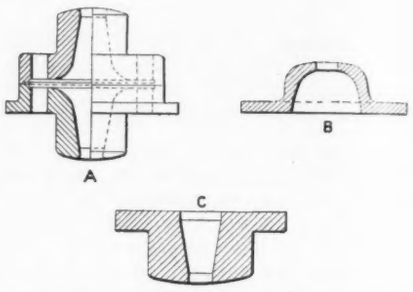
New-Type Button Designed to Prevent Flattening the Rope in Installation.



Rope breakage at the splice buttons was another difficulty encountered soon after the installation went into operation. At that time, splice button *A* in the accompanying sketch was used, together with Roebling 6x19 "Blue Center" steel rope, alternate regular and Lang lay, with independent wire-rope center. The socketing method with button *A* consisted of heating the end of the rope to a cherry red to facilitate handling, separating the strands and bending the ends in toward the center. The basket was then filled with molten babbitt.

Tests made by Roebling showed that with this method of socketing the rope failed at 125,700 lb., all strands breaking in the socket basket at the point where they were bent back in the socketing operation. At 84,000 lb. the total movement of the rope in the basket in one test was $\frac{7}{32}$ in., increasing to $\frac{9}{32}$ in. in 15 minutes. In a second test made in the same manner the total slippage reached $\frac{1}{4}$ in., and the rope failed at 125,570 lb.

Tests also were made on the strength of the rope with splice button *B*, which was socketed in the same way as button *A*. In two tests with this button, the strands also broke in the basket, although, in these particular instances, rope strength reached 152,350 and 158,700 lb. respectively. In making these tests, a standard rope socket was used on the opposite end of each test piece, and in one test where records were kept of movement in both the splice button and standard rope socket



A and B, Splice Buttons With Old-Type Baskets; C, Button With Standard Rope Socket Basket.

the total movement of the rope in the splice button at 100,000 lb. was $\frac{1}{4}$ in., as compared with $\frac{9}{32}$ in. in the standard socket.

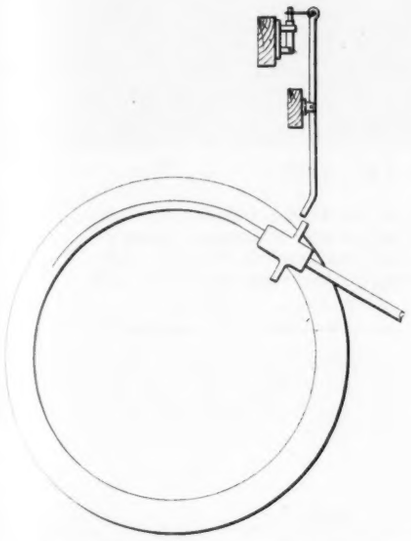
As a result of these tests, the company recommended the use of a splice button incorporating the standard size basket for $1\frac{3}{8}$-in. rope (button *C* in the sketch). In a third series of tests, the first took place on a piece of rope with standard rope sockets at each end, showing an ultimate rope strength of 158,640 lb. Tests No. 2 and No. 3, respectively, were concerned with buttons using the standard basket as socketed by Roebling and at the mine. Results were:

	Attached by Manufacturer	Attached by Mine force
Slippage at 34,000 lb., in.	$\frac{1}{16}$	$\frac{1}{32}$
After 15 min., in.	$\frac{1}{16}$	$\frac{1}{32}$
Total slippage at 84,000 lb., in.	$\frac{3}{32}$	$\frac{1}{16}$
After 15 min., in.	$\frac{3}{32}$	$\frac{1}{16}$
Total slippage at 100,000 lb., in.	$\frac{1}{8}$	$\frac{3}{32}$
Ultimate strength, lb.	158,130	158,840

The above results indicated that the full strength of the rope was developed, and further that the slippage encountered was practically negligible and of no consequence. The final design of splice button, as well as the revised method of field attachment, were therefore considered satisfactory.

One unusual departure from the general practice with rope-and-button conveyors is the use of oil on the return trough. Before the oiling system was adopted, slivers of steel frequently were

stripped off the trough by the action of the buttons, resulting in the breakage of buttons. In addition, it was necessary to replace the steel plates in the trough sometimes as often as every two or three weeks. To oil the return trough, a 1¼-in. compressed-air line installed in the roof of the gallery was used. Valves were attached every 50 or 60 ft., and an oil tank was installed in the headhouse. About 35 gal. of blackstrap is used per day.



Mechanical Trip for Stopping Conveyor. This Trip Is Installed at the Head Sheave.

To prevent damage resulting from buttons riding up, and therefore failing to seat themselves properly in the gaps of the head and tail sheaves, mechanically actuated switches for stopping the conveyor motor also have been installed. The tripping mechanism at the head sheave is shown diagrammatically in the accompanying sketch. If the button fails to seat properly for any reason, the top edge strikes the bottom of the lever, which in turn pulls the knife switch, breaking the circuit through relays and shutting down the motor. The tripping mechanism at the bottom of the conveyor is installed under the sheave wheel, and consists of a horizontal bar suitably mounted and connected to a switch.

Tools for Use in Setting Brush Holders

When direct-current generators are used, according to John J. Nolan, Terre Haute, Ind., it occasionally becomes necessary to remove the brush holders or both the brush holders and studs. In case this is necessary, their re-installation in the correct positions becomes a difficult task on some types of machines, though on others, where the studs are spaced equally around the commutator and all are at the same distance from each other, the work is not so onerous.

The Firing Line

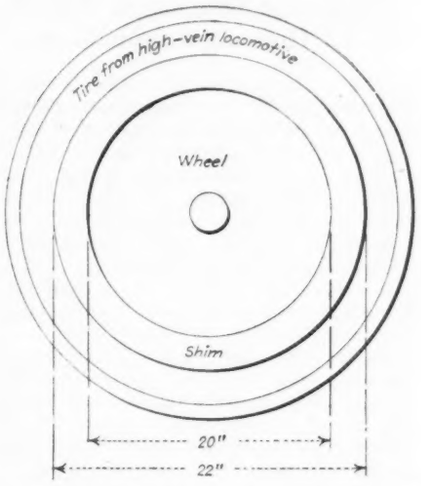
The operating officials at a mine are the connecting link between management and men. As such, their position is important, for it is their duty to see that every man and every piece of equipment works effectively, that conditions are made as safe as possible and that supplies are used efficiently. To accomplish these objectives, operating electrical and maintenance men must know their jobs, and must be able to cope with the problems that crop up from day to day. These pages offer each month a number of practical ideas for the use of such men, and also are open to those who have developed new answers to operating problems. Send in your idea. *Coal Age* will pay $5 or more each for those that are acceptable.

For use in setting brush holders accurately in the first class of machines so that all of them are at the same angle to insure each brush covering the same number of segments, Mr. Nolan offers the tools shown in the accompanying sketch. These tools are used with a paper slip marked off in equal spaces according to the number of brush-holder studs and fastened around the outer edge of the commutator, which is common practice. The method is shown in the illustration, the point of the tool resting on the spacing mark on the paper. Thus, the difficulty of securing accurate spacing by using brushes, either new or with the leading or trailing edges worn so that they do not fit down accurately on the commutator, is eliminated.

By using these tools, says Mr. Nolan, it is not necessary to face the brushes until the holders have been fastened into position. The edges of each brush will then rest on the marks, as did the point of the tool. The fiber spacing tool is made of two or more thicknesses of material for flexibility, thus permitting it to conform to the shape of the commutator when pressed down by the brush holder.

Changing Locomotive Tires Reduces Waste

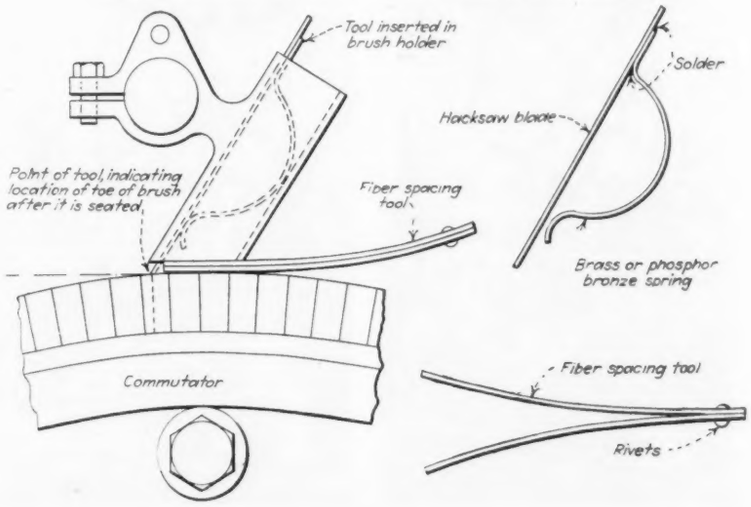
J. A. Ray, Leona Mines, Va., describes a method of interchanging tires on high- and low-vein gathering locomotives to eliminate waste through discarding one size before it is worn out.



Shim and Tire in Place on Low-Vein Wheel

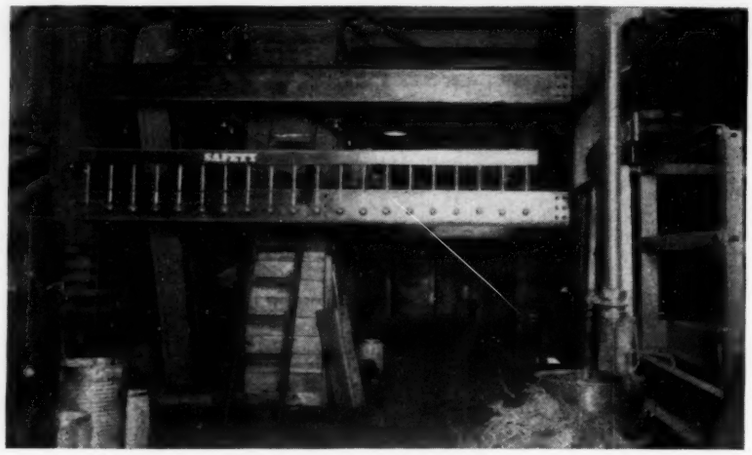
Wheel diameters on the low-vein locomotives are 20 in., and on the high-vein machines, 22 in. On both types, it was found that the tires could be turned but once, as any additional reduction in

Construction and Use of Tools for Setting Brush Holders



diameter caused the locomotives to drag the roadways in places where the track was dirty or sharp dips were present.

At the present time, old tires for the low-vein locomotives are turned down to an outside diameter of 22 in., and the flanges are removed, thus making a shim which increases the low-vein wheel diameter to 22 in. After tires from the high-vein machines have reached the maximum service life possible with one turning, they are turned the second time and are placed on the low-vein wheels over the shims. This makes the low-vein locomotives about the same height as they would be if new tires were applied and saves their cost. This arrangement, says Mr. Ray, is possible with any locomotive installation where the wheel diameters differ 2 in.



Warns the Tall Man

Where headroom is restricted in the Coaldale breaker of the Lehigh Navigation Coal Co., the signal shown above is installed to give the taller-than-average man warning to "duck." The wooden trailing members are joined to the support and to each other by hooks and eyes.

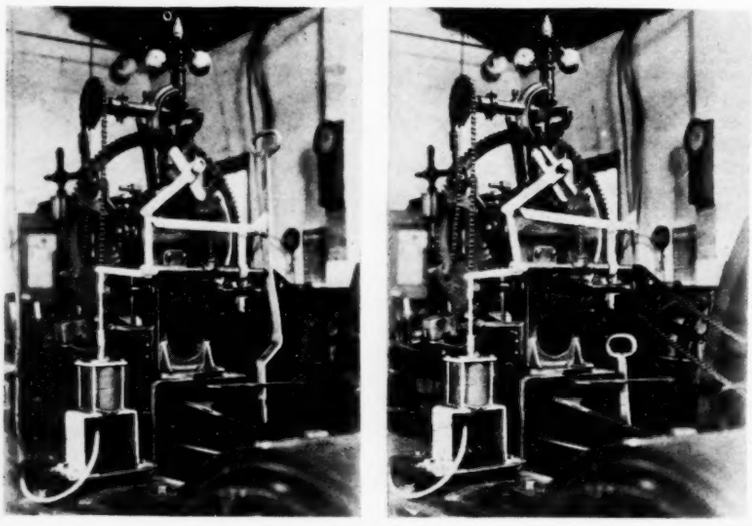
Magnetic Attachment Added To Hoisting Engine Stop

The accompanying illustrations show an ordinary Welch hoisting engine stop to which has been added an electrical mechanism which enables the cager at the bottom of the 320-ft. shaft to apply the steam brakes on the surface and thus stop the hoist any time it may be necessary. This equipment is used at the No. 2 mine of the Bell & Zoller Coal & Mining Co., Zeigler, Ill., and was designed by the company electrician and mechanic. John Lyons, safety engineer, furnishes the description.

In the lower left of the illustrations is shown a frame in which two coils similar to the operating coils on automatic reclosing circuit breakers are mounted. A cylindrical brass core is inserted in the center of the coils, which are connected in parallel to two of the conductors of a four-conductor waterproof cable extending to the shaft bottom. (The other two conductors are used for the telephone.) At the shaft bottom, the conductors are connected to a 30-amp., double-pole knife switch, which is held open by a spring. Instead of the usual switch handle, a piece of 4x4x¾-in. fiber is fastened over the poles so that the switch may be hit quickly with the hand to close it.

Closing the switch energizes the coils on the surface, and the brass core pulls down an iron rod (see illustrations). This, in turn, moves a bell crank, and the extension of this motion to the other members of the system kicks the lever handle off the hook. The handle then falls down, thus applying the steam brake and closing the throttle to stop the hoisting engine. The magnetic stop is tried out every morning while the cage is in motion, and a report is made to the superintendent. This engine makes an average of four hoists a minute, which does not allow much time for the cars to engage the dogs, with the result that if the car is not properly on the cage it is pulled up against the roof, crushing the car and, occasionally, breaking the rope. With this mechanism and the quick-acting switch at the bottom, the engine is now stopped before any damage can be done. The equipment has been in use for over eight years and has prevented numerous wrecks.

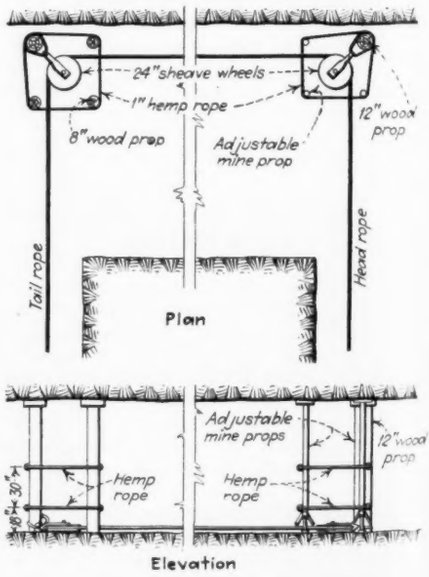
Left, Magnetic Stop in Operating Position; Right, Stop Tripped by Closing the Switch at the Shaft Bottom



Fencing Scraper Sheaves Reduces Hazards

To obviate the hazards growing out of the failure of scraper sheave fastenings in service, the revised code of standards of the Union Pacific Coal Co., Rock Springs, Wyo., prescribes the use of the fences shown in the accompanying illustration. Fences for head rope sheaves are made with adjustable steel props, while wood props are used in making the fences for tail rope sheaves. Hemp rope is used in tying the individual props together.

Plan for Fencing Upper Sheaves in Scraper Loading Places



WORD from the FIELD

New Preparation Facilities

New contracts for preparation facilities at various coal operations were reported as follows in August:

HARDY COAL CO., Isaban, W. Va.; new air-cleaning plant consisting of American Coal Cleaning Corporation pneumatic separator and auxiliary equipment for cleaning 1½x0-in. coal went into operation on Aug. 29; capacity, 50 tons per hour.

HILLMAN COAL & COKE CO., Naomi mine, Fayette City, Pa.; now erecting a new steel tipple with a capacity of 2,000 tons per day and equipped for river, rail and truck shipments. Jeffrey Mfg. Co. is the general contractor, and the Naomi plant duplicates the facilities recently completed at the Pike mine, Brownsville, Pa.

INLAND STEEL CO., Wheelwright, Ky.; contract closed with the American Coal Cleaning Corporation for a complete all-steel air-cleaning plant, for which provision was made in the design of the original Wheelwright preparation plant. The plant will consist of one American pneumatic separator, recirculating dust-collection system, 150-ton steel storage bin, conveyors and auxiliary equipment. Capacity is 320 tons per hour of 6x0-in. coal, which will be crushed to ¾x0-in. before cleaning; to be completed Nov. 1.

MONTANA COAL & IRON CO., Bear Creek, Mont.; contract closed with the Roberts & Schaefer Co. for Stump "Air-Flow" coal cleaner to treat 2x¾-in. coal; capacity, 40 tons per hour; to be completed about Dec. 1.

PITTSBURG & MIDWAY COAL MINING CO., Mine No. 15, Pittsburg, Kan.; contract closed with the McNally-Pittsburg Mfg. Corporation for Norton coal washer for treating ¾x0-in. coal; capacity, 125 tons per hour; dewatering screens and loading facilities included. This equipment is in addition to the 100-tons per hour Norton washer reported last month, which will now treat 5x¾-in. coal, instead of the 5x⅜-in. product originally contemplated.

Mines Resume

With production showing a steady gain over last year's figures, an increasing number of mines resumed operation in August. Among the resumptions reported last month were the following:

Alabama—Manchester mine, Manchester Coal Co.

Colorado—Canon Reliance Coal Co., Wolfpark mine, Canon City, working force increased; Colorado Fuel & Iron Co., 600 men added at the Frederick and Crested Butte mines; W. C. Eichelberger Co., resumed operations at the old Colorado-Pinnacle operation, Bear River; Peanut anthracite mine, Crested Butte, under new management.

Illinois—Donk Bros. Coal Co., Thermal mine, Edwardsville; Franklin Coal Co., Franklin County mine, Benton; Penwell Coal Mining Co., Pana.

Indiana—Binkley Coal Co., Miami No. 4, Clinton.

Ohio—Luhrig Collieries Co., Luhrig mine, Athens; Sunday Creek Coal Co., No. 5, Murray City.

Virginia—Splashdam Coal Corporation, Splashdam mine.

West Virginia—Sixty-three operations added to the active list between March 1 and Aug. 1; resumptions reported in August were as follows: Ruth mine, Old Delmar Coal Co., Flemington, W. Va., taken over by the South Pittsburgh Coal Co.; Dingess Run Coal Co. mine, Sunbeam, taken over by new management; Annabelle mine, Four States Coal Co., Four States, taken over on lease by new operating group; Glenwood Smokeless Coal Co., Larew; Guston Run Mining Co., Guston Run; Hutchinson Coal Co., Dabney mine, Kleenkoal; Lake Superior Coal Co., No. 2, Superior; Francis mine, Montfair Gas Coal Co., Kilarm, taken over by new operating group; Osage Coal Co., Nos. 1 and 2, Osage, returned to two-shift operation with additions to mine forces; Winding Gulf Collieries Co., No. 3 mine and possibly briquetting plant, Davy; United States Coal & Coke Co., one additional operation reopened.

Pennsylvania anthracite—Glen Alden Coal Co., Wanamie, South Wilkes-Barre and Loomis collieries; Hudson Coal Co., Delaware and Laurel Run mines, Laflin breaker, Marvine colliery; Kingston Coal Co., Gaylord shaft, last operated 35 years ago; Lehigh Navigation Coal Co., Greenwood colliery and one stripping; Philadelphia & Reading Coal & Iron Co., Alaska and West Shenandoah collieries; Pittston Co., Old Forge and Forrest City collieries.

Coal Production Up

Bituminous coal production rose to 33,852,000 net tons in August, according to preliminary figures compiled by the U. S. Bureau of Mines. Production in July was 29,482,000 net tons, and the output in August, 1932, was 22,489,000 tons. Anthracite production was 4,387,000 net tons in August, against 3,677,000 tons in July and 3,465,000 tons in August, 1932.

Total production of bituminous coal in the first eight months of this year was 208,544,000 tons, an increase of 23,610,000 tons, or 12.8 per cent, over the total of 184,934,000 tons in the same period in 1932. Anthracite output in the first eight months was 30,451,000 tons, a decline of 197,000 tons from last year's total of 30,648,000 tons.

Mine Safety to Be Stressed At Chicago Congress

Mining safety in all its phases will again be the topic of the Mining Section of the National Safety Council at the annual safety congress, to be held at the Stevens Hotel, Chicago, Oct. 2-6. Subjects scheduled for discussion at the various sessions are as follows:

Tuesday—"Safety," C. E. Bockus, president, Clinchfield Coal Corporation and the National Coal Association; "Greetings from South Africa," J. W. Straw, safety inspector, Roan Antelope Copper Mines, Ltd.; "Physical Examinations and Accident Prevention," Dr. W. C. Mays, plant physician, Elkhorn Piney Coal Mining Co., Stanaford, W. Va.; "How Can Interest in Accident Prevention Be Best Maintained?" Lt.-Col. H. A. Reninger, special representative, Lehigh Portland Cement Co.

Wednesday—"Following Through With Safety," Theodore Marvin, editor, *The Explosives Engineer;* "Discipline and Accident Prevention—Anthracite," Cadwallader Evans, Jr., general manager, Hudson Coal Co., Scranton, Pa.; "Safety and Health in the Metal-Mining Industry," A. H. Findeisen, Industrial Commission of Wisconsin.

Thursday—"Bonus Payments or Rewards for Safety Records in Coal Mining," Eugene McAuliffe, president, Union Pacific Coal Co., Omaha, Neb.; "Bonus Payments or Rewards for Safety Records in Metal Mining," speaker to be announced; "Compensation and Safety," W. H. Nickels, Jr., Industrial Commission of Virginia; "Accident Prevention in the Mines of South Africa" (with motion pictures), Edmund Steinberg, Rand Mutual Assurance Co.

Natural Gas to Twin Cities

Northern Gas & Pipe Line Co., operating a 24-in. natural gas line from the Panhandle field of Texas to points in Iowa and Nebraska, has let a contract for the construction of an extension to Minneapolis and St. Paul, Minn., to the Fredell Construction Co., Amarillo, Texas. The new extension, via Owatonna, Minn., will increase the line load by 20,000,000 cu.ft. daily, it is reported.

Mines Add Power Equipment

Anchor Coal Co., Highcoal, W. Va., has added a 303-hp., stoker-fired boiler to its power plant equipment. The boiler was furnished and installed by the Union Iron Works, Erie, Pa.

Pikes Peak Fuel Co. has added a 586-hp., B. & W. boiler to the power plant equipment at its Pikeview mine, Carlton, Colo. The boiler will be fired by a Type E underfeed stoker furnished by the Combustion Engineering Co., New York. Continuous rating of the stoker on 8,100-B.t.u. Colorado lignite is 112 per cent.

NRA Code Making for Soft Coal Industry Enters Into "Final" Stages

(Continued from page 293)

period of peak demand, ranging from 60 days to four months, commercial mines in the Far West, he maintained, should be permitted to operate a maximum of 48 hours per week; operators in that area were willing to leave the maximum work week in the off-peak months to the determination of NRA.

Speaking for hand-operated mines in southern Tennessee and Georgia, H. J. Weeks, Durham Land Co., sought approval of a minimum of 25c. per hour for unskilled inside and outside labor, and tonnage rates of 45c. to 75c., dependent upon the thickness of the seam. Jacob Ritter, president, Coal Operators' Association of Appanoose and Wayne Counties, protested against mines in those two Iowa counties paying the same rate as the rest of the state, because, he said, they had thin-seam coal geologically a part of the northern Missouri field, where a $3.75 rate prevailed. He asked that Appanoose and Wayne counties be given that rate, but expressed a willingness to accept a base rate $1.10 under the Iowa scale and complained that refusal of the union to negotiate on that basis had resulted in the shutdown of mines in those two counties since April 1.

Operators in all states had been invited to attend the conferences at which the so-called "General" code had been worked out, said George B. Harrington, president, Chicago, Wilmington & Franklin Coal Co. Companies with mines in Illinois, Indiana, Iowa, Michigan, Ohio, West Virginia, Kentucky, Arkansas, Oklahoma, Colorado, Montana and Wyoming had participated in the actual code making. Representatives of the United Mine Workers had joined in working out the labor provisions and had assented to all such provisions except that relating to hours. Under this code, operators have the option of running 40 hours per week for six months and 32 hours for the rest of the year or 36 hours throughout the year. In each case, the maximum work day is fixed at 8 hours with certain exceptions.

Mr. Harrington said that this code was the one attempt at a single, national code. He disagreed with witnesses who favored separate district or regional codes. To avoid the complex job of setting forth all specific rates in one code, the proponents of the General code had adopted the simple formula for basic minimum rates of $4 outside and $5 inside. All codes filed endeavored to protect the producer from chiseling competitors; the General code, he stated, was unique in that it also attempted to protect the worker from the chiseling employer. In pursuit of that end, provision had been made for checkweighmen; semi-monthly payment of wages, less any legitimate deductions, in lawful money or par check; freedom, except in the case of supervisory and maintenance men, for the employee to live where he chose and for all workers to trade where they desired.

While this code provided for a differential of 5 per cent under the base rates for mines south of the Ohio River, Frank E. Taplin, president, North American Coal Corporation, scouted the idea that such a "concession" was justified by any difference in living costs in the two sections. He attacked union proposals for a 6-hour day. He warned NRA that the increase in wages must be met by higher selling prices and that, unless NRA took charge of the competitive fuel situation, these increases would mean decreased employment in the mining fields. Like Mr. Harrington, he believed that the district selling agency as now constituted was not the complete answer to the sales question, since these agencies were without power to police non-members.

In support of the demand for a 30-hour week, John L. Lewis, president, United Mine Workers, argued that eight hours at the face is excessive. A reduction in hours would decrease accidents and help increase efficiency. He contended that a 30-hour week is necessary to stabilize operations in the industry "upon the basis of a reasonable field of employment and earnings." Reduction from eight to six hours is essential to provide employment for available men on the basis of an annual production of 500,000,000 tons. Such a reduction would check overproduction, stabilize costs and maintain wages at reasonable levels. "The 8-hour day will continue the present chaos."

Mr. Lewis asserted that the rates agreed upon in the General code were "very moderate" and that, based upon Bureau of Labor statistics on costs of living, even if the men worked 250 days a year, the minima would yield net earnings $200 to $500 below living wage requirements for a family of five. The union was willing to go along with these rates, he explained, because they "represent a considerable advance over the indefensible minimum rates which have prevailed this year in certain districts both north and south."

Exception to the union demand for a shorter working day was taken by D. W. Buchanan, president, Old Ben Coal Corporation; Eugene McAuliffe, president, Union Pacific Coal Co.; and Earl Cobb, president, San Bois Coal Co. To pay the same wages for six hours as for eight, Mr. Buchanan pointed out, would mean an increase of 33⅓ per cent in base rates. This would widen the field for competitive fuels. Even without an increase in hourly rates, reduction in the work day would materially increase production costs because mines have been laid out and developed on an 8-hour plan. Both Mr. Buchanan and Mr. Cobb stressed the seasonal character of business in many fields and argued that men must be able to work when work is available. These views were indorsed by Mr. McAuliffe, who also emphasized the competitive situation.

Industry must recognize the partnership between capital and labor, declared Howard Showalter, president, Continental Coal Corporation, in defending the minima named in the General code. These minima, he said, are not excessive, although they mean an increase of 80 to 90 per cent over the base rates prevailing in northern West Virginia prior to Aug. 1.

Although southern Ohio operators had filed a separate code, they were ready to concur in the General code if that document was to be considered as national in its application, said George K. Smith, president, Sunday Creek Coal Co. He did ask, however, that the provision covering prices, reading: "Failure to maintain such prices as will return the fair average cost of production shall be deemed a violation of this code" be amended to read:

> Fair and reasonable minimum prices may be fixed from time to time by the respective districts on the several grades, sizes and classifications of coal produced; such prices shall be based on the fair average cost of production and sale and the competition of substitute fuels and other forms of energy and upon other competitive market factors. Failure to maintain such prices when so fixed shall be deemed a violation of this code.

Hubert E. Howard, president, Binkley Coal Co., felt that each mine should be prohibited from selling below its individual cost of production, rather than using the average for the field in applying the bar. His method, he said, would be a public protection and promote more efficient operation. Charles F. Hosford, Jr., president, Butler Consolidated Coal Co., also spoke in favor of the General code and joined in the condemnation of multiple codes. He believed each district should enjoy the advantages of its coal and its geographical location, but decried artificial protection by way of wage differentials.

Miss Josephine Roche, president, Rocky Mountain Fuel Co., added her plea for indorsement of the General code. Under union operation, she said, production costs had declined 12 per cent, average output per man per day had increased 0.6 ton and was now 1.6 tons above the state average in Colorado, while average earnings per man at her mines had advanced $500 per year since unionization.

Warren Pippin, appearing, as he said, for "what is left of" the coal industry of Michigan, also approved the General code, although he opposed the 5 per cent differential in favor of Southern mines. Michigan producers could make no legitimate complaint against losses in tonnage due to the superior sales ability or the superior quality of the product of rival producers, but they did object to surrendering tonnage to competitors who captured it only through their ability to chisel on labor. Michigan mines, he added, have been closed since the expiration of their last wage contract in March, because operators and the union have been unable to get together on wages, and that inability is brought about by the low levels prevailing in Ohio, Michigan's nearest competitor.

W. Wood Guthrie, Prairie State Coal Co., Granville, Ill., while subscribing to the General code, asked that his company, operating in a 3½-ft. seam, be given a wage differential to offset higher

production costs. C. G. Stiehl, spokesman for the St. Clair and Madison Coal Operators' Association of Illinois, protested the General code provision for an investigation into trucking. A substantial proportion of the output in those counties comes from small, hand-operated mines which ship by truck, and these mines, he contended, should be encouraged, because they employ more men per ton than the mechanized mines.

A moratorium on the use of loading machines during the present emergency was advocated by W. C. Kane, who spoke for the Sahara, Rex and Wasson coal companies, operating in Saline County, Illinois. He detailed the negotiations under which miners at those operations had consented to accept wages 10 per cent under the Illinois scale if the operators would remove all loading machines and conveyors from their mines. This withdrawal of machines, he said, had increased the average number employed from 240 to 379 men within a few months. He advocated a differential between hand-loading and mechanical-loading mines.

R. W. Miller, president, Coal Producers' Association of Illinois, explained that the code prepared by his group after consultation with the Progressive Miners' Union was in accord with the General code except on the matter of hours. Because of the seasonal character of the industry, his organization opposed a shorter working week than 48 hours. He wanted minimum prices fixed upon the weighted average cost of production for an entire district. C. T. Pearcy, president of the Progressive Union, said that his organization subscribed to the provisions of the code filed by the Miller group, although it would gladly join in a voluntary revision of its contract with the operators to provide for a reduction in the number of hours.

Alabama, declared Forney Johnston, in behalf of the Alabama commercial mines, flatly refused to accept any code which did not guarantee the state autonomous government "without a contest." He also objected to the injection of the union question into the situation at a time "while we are still in a tail spin with our workers and must preserve the status quo." Successive wage adjustments since June 15 have added 38c. per ton to the cost of production at commercial mines in the state and, on the basis of 1932 volume, without any increase in price, would mean a loss of 65c. per ton (exclusive of interest and other capital charges) to the operators.

The critical situation in the Alabama coal industry, he continued, is due not to the depression but to the competition of oil, gas and hydro-electric power. NRA, he argued, does not propose and has no power to increase the cost of distribution or the sales price of these competitive sources of energy and further competition is threatened by the Tennessee Valley Authority, which plans to generate more current at Muscle Shoals and lower the prices.

Western Kentucky, which proposed minimum rates of 33c. per hour for able-bodied inside workers and 28c. for outside labor, is handicapped in selling its output by the absence of a substantial home market, losses to substitute fuels in the South and Southwest and by freight differentials of 35c. to $1.16 per ton over Illinois and Indiana in reaching markets north of the Ohio River. Under these conditions, contended Charles F. Richardson, president, West Kentucky Coal Co., to force wages up further would increase unemployment and paralyze the western Kentucky field. Moreover, the minima named in the western Kentucky code are materially higher than rates paid common labor for other occupations there.

In preparing its code, the Coal Trade Association of Indiana, said Charles G. Hall, general manager, Walter Bledsoe & Co., had invited the participation of mines having union contracts, operators dealing collectively with their men through local unions or otherwise and of cooperative mines. It was not the intent of the code to affect any basic rates fixed by wage agreements. The minima named, however, involve an increase of more than 100 per cent in rates at most of the cooperative mines. Indiana did not join with Illinois in the General code because it would mean that the Hoosier mines would be compelled to pay higher rates for certain classes of labor, but would be unable to induce their men now receiving rates above Illinois to accept reductions. The net result would be an increase of approximately 9½ per cent over Illinois. The position taken by Mr. Hall was indorsed by Harvey Cartwright, commissioner of the association, and by William R. Bootz, speaking for the Southern Indiana Coal Producers' Association.

A like situation was advanced by George Heaps, Jr., Iowa Coal Operators' Association, to explain why Iowa had not joined in the General code. Up to 1928, he explained, Iowa was on practically the same wage basis as Illinois, and tonnage changes followed changes as made in Illinois rates from time to time. In the latest readjustment, however, while Iowa was still on a $5 basis from the standpoint of actual production costs, there had been a readjustment as between day and tonnage rates; the base day rate had been fixed at $4.70 and the remaining 30c. had been absorbed in increases in rates for tonnage, yardage and deadwork. The framers of the General code, he claimed, had refused to recognize this situation. W. C. Shank, president, Southwestern Coals, Inc., representing 75 per cent of the tonnage of Kansas, Missouri and Oklahoma, captured the brevity record by saying that his group would rest its code case on a printed brief.

Demand for a 6-hour day and a minimum daily wage of $6 for both day and tonnage men was made by Frank Borrich, secretary of the National Miners' Union. The spokesman for the Communistic labor organization also told his audience that that union was busy enrolling members in Utah, New Mexico, West Virginia and western Pennsylvania. Abolition of company stores, company towns, company police and the check-off and the establishment of compulsory unemployment insurance were offered as part of National Miners' Union program.

At the conclusion of the hearings, Mr.

Additions to List of Approved Explosives

Nineteen additions to the active list of permissible explosives were made by the U. S. Bureau of Mines in the year ended June 30. Details are given in the following table:

	Volume Poisonous Gases	Characteristic Ingredient	Weight of 1¼x8-In. Cartridge, Grams	Smallest Permissible Diameter, Inches	Unit Deflective Charge, Grams	Rate of Detonation in 1¼-In. Diameter Cartridge, Ft. per Sec
[1]Black Diamond No. 7-A	B	Ia	155	¾	232	11,410
[1]Black Diamond No. 8	A	Ia	134	¾	214	7,490
[1]Black Diamond Nu-Gel No. 2	A	6	232	¾	265	10,890
[2]Coalite L, L.F.	A	Ia	111	¾	219	8,760
[2]Coalite O, L.F.	B	Ia	92	¾	229	7,610
[2]Gel-Coalite U, L.F.	A	6	143	¾	227	10,140
[2]Gel-Coalite V, L.F.	A	6	162	¾	230	10,200
[3]Hercoal C-1	A	Ia	117	1	230	9,280
[3]Hercules Coal Powder 2	A	Ia	168	1¼	212	9,280
[4]Apcoal No. 1, L.F.	A	Ia	175	¾	225	7,540
[4]Austin Red Diamond No. 11, L.F.	B	Ia	100	¾	222	5,740
[5]Big Red No. 10	A	Ia	177	1	217	7,710
[6]Burcoal 4, L.F.	A	Ia	128	1	216	5,900
[7]Genite E	B	Ia	107	1	232	5,900
[8]Liberty No. 7	A	Ia	177	1	217	7,710
[8]Liberty No. 9	A	Ia	114	¾	215	5,580
[8]Liberty No. 11	B	Ia	86	1	220	7,050
[3]Hercogel 2	A	5	186	¾	228	11,840
[3]Hercogel A	A	6	220	¾	247	14,630

Explanation of symbols: A, volume of poisonous gases less than 53 liters; B, volume of poisonous gases between 53 and 106 liters; Ia, ammonium nitrate explosives with explosive sensitizer; 6, explosives in which nitroglycerine is gelatinized with nitrocotton. [1]Illinois Powder Mfg. Co. [2]Atlas Powder Co. and Giant Powder Co. [3]Hercules Powder Co. [4]Austin Powder Co. [5]Equitable Powder Mfg. Co. and Egyptian Powder Co. [6]Burton Explosives, Inc. [7]General Explosives Corporation. [8]Liberty Powder Co.

Eighteen explosives were transferred from the active to the inactive list in the year ended June 30, as follows: Apache Coal Powders D, E and F, L.F., and Apache Coal Powder S; Coal-Gel Nos. 1 and 2; Gel-Coalites U and V, L.F.; Genigel No. 1; Grasselli 7, L.F.; Hercoals C and F; Min-ite No. 5-D; Miner's Friend Nos. 4 and 5, L.F.; Monobel No. 4, L.F.; Peerless No. 4; and Red H No. 6. The present active list contains 133 brand names, as compared with 132 in the preceding twelve months. No additions, removals or changes took place in the active list of permissible blasting devices during the year.

Simpson announced that there would be a conference of interested parties on Aug. 22. But the conference was hastily called for Aug. 18. In the meantime, Messrs. Johnson and Simpson had been summoned to the White House to discuss the situation, "the Four Horsemen" were invited to the Executive Mansion and promises of an early promulgation of a code began to fill the air. A few hours before the time set for the conference, staff members of NRA were instructed to prepare a code for submission to the conference. Midnight lamps burned brightly, a code was prepared and instructions were given to have 75 confidential copies mimeographed. Possibly drunk from lack of sleep and unable to understand a run of such modest proportions, somebody forthwith proceeded to have 750 copies struck off and duly mailed to the newspaper list of NRA. By the time NRA officials had examined the proposed code in the cold morning light, decision was reached to bury this brain-child.

With the stage thus appropriately set, the tragi-comedy moved from climax to anti-climax and back to climax, and several times teetered on the edge of catastrophic conclusion. The operators summoned to conference on the morning of Aug. 18 discovered that the meeting had been postponed until later in the day. Gathered in the caucus room of the old House Office Building that afternoon, they were informed that it was obviously impossible to make any progress in a "town-hall meeting" and were requested to name committees of one or two men from each group sponsoring a code to confer with the Administrator and his aides the next morning.

Again the meeting was postponed until afternoon when General Johnson, telling the conferees that the thirteen colonies had composed their differences and formed a union, announced that NRA demanded one simple basic code for the industry. Mr. Richberg told them that that code should include provisions for labor mediation. Each committee group was then requested to return to its individual hotel headquarters in Washington to await further summons from the Administration. At least two of these committees remained in cloistered seclusion for more than ten days and perhaps might still be waiting for the summons if they had not grown impatient and barged in uninvited on NRA headquarters after the first of September.

Part of this delay, of course, was due to the development of the NRA strategy on wages. If it could bring the Appalachian operators and the United Mine Workers together, its task of fixing wage minima would be greatly simplified, since it could then write into the new code the wages so agreed upon. This would mean that the choice between the scale set forth in the General code—the only code offered to cover the entire industry—and a scale acceptable to the Appalachian group, which produced over 70 per cent of the tonnage last year, would no longer be up to the NRA. Alabama and western Kentucky would be the only nettles NRA would have to grasp.

So, in the week following the Aug. 18-19 conferences, the Appalachian operators were persuaded to write a letter to General Johnson stating that they were ready to confer with representatives of their employees and, in turn, the operators were invited to confer with officials of the United Mine Workers. In the meantime, the automobile code, with its clause stating that employers reserved the right to hire, fire and advance on merit without regard to membership or non-membership of the employee in any labor organization, had passed the President and a great to-do was made about the radio address of General Johnson which was to clarify Section 7(a). Waiting for this last word in authoritative interpretation, which bore Mr. Richberg's approval and eliminated "open" and 'closed shop" from the NRA lexicon, the historic conference was postponed until Aug. 24.

On the morning of that day, the four spokesmen for the Appalachian operators met with John L. Lewis; Philip Murray, vice-president of the United Mine Workers; Thomas Kennedy, secretary-treasurer; and Van A. Bittner, international representative of the union in West Virginia. In the afternoon, the conference was enlarged to take in E. C. Mahan, president, Smokeless and Appalachian Coal Association; Oscar M. Deyerle, president, Flat Top Fuel Co.; D. C. Kennedy; H. R. Hawthorne, vice-president, Pocahontas Fuel Co.; P. C. Thomas, vice-president, Koppers Coal & Transportation Co.; S. A. Scott, vice-president, New River Co.; R. J. Burmeister, general manager, Raleigh Coal & Coke Co.; A. R. Beisel, general manager, Island Creek Coal Co.; Heath S. Clark, vice-president, Rochester & Pittsburgh Coal Co.; R. E. Jamison, secretary, Jamison Coal & Coke Co.; R. L. Ireland, Jr., vice-president, Hanna Coal Co.; Walter Robison, president, Youghiogheny & Ohio Coal Co.; George S. Brackett, cost accountant, and Fred A. Krafft, director of employment relationships, Consolidation Coal Co.; and A. B. Crichton, president, Manor Coal Co. Twelve additional members of the union joined their associates in this conference.

"This conference," announced General Johnson, "will proceed by direction of the President under supervision of NRA, which will lay down the program of negotiations and act as mediator throughout. The officials of this Administration in this endeavor will be the Administrator; the General Counsel, Donald Richberg; and the Deputy Administrator in charge, K. M. Simpson. This arrangement was made possible through the good offices of the President and has his approval."

Two days later the Appalachian group submitted a revised code in which the original qualifications to Section 7(a) of NIRA were eliminated, but a "merit" clause similar to that in the automobile code was inserted. The revised code also set up mediation machinery for the settlement of labor disputes. Under these provisions, employees at a mine would elect a committee of five to negotiate with the mine management in case of differences between employees and employer. Where this mediation was ineffective, the case would go to a district mediation board of two members, resident of the district, one of whom would be named by the Industrial Advisory Board and the other by the Labor Advisory Board of NRA. If this board failed to settle the dispute, it would then pass for final decision to a board of adjustment of five members, two to be named by each of the advisory boards and the fifth member by the President. Pending final decision, "no employee shall cease work because of such dispute."

On Aug. 28, General Johnson announced that the negotiating committees had reached a basis of agreement covering the principal points at issue and that the Administrator was willing to recommend that basis to the President. This basis involved a 40-hour week and an increase in base rates of 76c. per day over those named in the Appalachian district code. On Sept. 1, while conferees were still debating specific details of the proposed contract, a stalemate was reached over the question of exclusive employment. Conferences were resumed on Sept. 5 with General Johnson, and the next evening the spokesmen for the operators and the union were called to the White House.

No detailed announcement was made of the decision reached at this conference. Unofficially, it was reported that the union, feeling confident that it had control of the majority of the workers in the Appalachian field, would forego any demand that the contract to be signed specify that only members of the United Mine Workers would be employed by the operators parties to the agreement. General Johnson contented himself with the issuance of a statement the next day declaring that as a result of the White House conference, "the operators and the United Mine Workers have cleared up their points of disagreement on certain labor clauses in their proposed contracts and are now proceeding to negotiation of details with what, I am informed, are excellent prospects of success."

The next snag in the labor negotiations was struck when the NRA proposed code was made public. Both sides decided to suspend further negotiations on wage contracts while they put the microscope on the code suggested by NRA. The flare-up between General Johnson and the Appalachian group over his brusque and profane rejection

Permissible Plates Issued

Three approvals of permissible equipment were issued by the U.S. Bureau of Mines in July, as follows:

(1) Jeffrey Mfg. Co., Type A-7 drill; 1½-hp. motor, 250 volts, d.c.; Approval 254; July 15.

(2) Goodman Mfg. Co., Type 336 entry-loader; 10-hp. motor, 250 volts, d.c.; Approval 255; July 31.

(3) Goodman Mfg. Co., Type 336 entry-loader; 15-hp. motor, 250 volts, d.c.; Approval 256; July 31.

The Bureau of Mines also announces the addition of BM-23 Amerclad No. 4 twin cable (7x19 stranding) to the list of "Specially Recommended Cables."

of a letter of objection to the code presented to him while he was at lunch Sept. 8 further imperiled the wage parleys. But after his peace conference with "the Four Horsemen" in his office later in the day, negotiations were again resumed.

While all these events in connection with the proposed wage agreements were taking place, announcements, forecasts and predictions that a code would be accepted by the industry "within the next 48 hours" or the President would invoke his powers to impose such a code under Section 3 of NIRA continued. First, it was reported that the President expected to sign a code before he left for Hyde Park on Aug. 19; then he was to have it sent to him at his summer home on Aug. 22. Despite these threats and rumors, the deadline kept moving further into the future with the passing of each day. The closest NRA came to releasing a code of its own authorship prior to Sept. 7 was on the Friday preceding, when the impasse over the question of exclusive employment was reached in the wage parleys. At that time, many were hopeful that an NRA code draft would be available for study over the Labor Day week-end, but these hopes went glimmering when General Johnson and his chief counsel failed to appear at NRA headquarters.

Under the code proposed by the Administration on Sept. 7, the industry is grouped into five divisions for general administrative purposes and into fifteen districts for wage making. The major divisions are:

Division I — Pennsylvania, Ohio, Michigan, Maryland, West Virginia, Kentucky, northern Tennessee, Virginia and North Carolina.

Division II — Illinois, Indiana and Iowa.

Division III — Alabama, southern Tennessee and Georgia.

Division IV — Missouri, Kansas, Arkansas, Oklahoma and Texas.

Division V—New Mexico, Colorado, Utah, Wyoming, North Dakota, South Dakota, Montana, Idaho, Washington, Oregon, California, Nevada and Arizona.

Operators in each division are called upon to establish a Divisional Code Authority within ten days after approval of the code. The President is to appoint one member without vote on each Divisional Code Authority. A National Bituminous Coal Board of ten members also is set up; five members are to be appointed from nominations made by each of the Divisional Code Authorities; the other five are to be the Presidential appointees on the Divisional Code Authorities. Divisional Code Authorities are to administer the affairs of their division "to the extent authorized by NRA and this code."

To handle labor matters, each division is called upon to set up: (1) mine adjustment committees for each mine; (2) district committees where collective bargaining is in force; and (3) divisional adjustment boards with equal representation for employees and management to handle disputes not finally settled by the mine or district adjustment committees. "All matters affecting hours, wages and conditions of employment not agreed upon individually shall, if possible, be negotiated to a conclusion between representatives of employers and representatives of employees as provided in Section 7 of NIRA, meeting either in the mine adjustment committee or district committee or divisional adjustment board. All disputes which cannot be adjusted by the mine adjustment committee shall be referred to the district and, if not adjusted (or if there is no district committee), then to the divisional adjustment board."

As a final governing body in labor matters the code proposes the creation of a National Bituminous Coal Labor Board of three members appointed by the President, one from nominations made by Divisional Code Authorities and one from nominations made by organizations of employees or representatives of their own choosing. Decisions of this board on disputes referred to it by divisional adjustment boards shall be accepted by the parties "as effective for a provisional period of not longer than six months, to be fixed" by the National Bituminous Coal Labor Board.

Except in the case of accident and also in the case of supervisors, clerks, technicians, employees handling mantrips and those required to remain on duty while men are entering or leaving the mine, the code proposes a maximum working day of 8 hours and a maximum work week of 36 hours. In the case of the work week, employers have the option of running 40 hours for any 26 consecutive weeks and 32 hours for the rest of the year. The code also includes a provision for sharing work with unemployed men on the signed petition of the majority of the employed workers.

Under conditions of employment, the code sets forth the mandatory provisions of Section 7(a) of NIRA. All tonnage payments are to be on a net ton basis except where otherwise determined by mutual agreement or physical conditions. Miners are given the right to employ checkweighmen and also to check the accuracy and fairness of measurements where other than the net-ton basis is permitted.

Wages, under this code, shall be paid in lawful money or par check at the option of the operators. No deductions shall be made from pay except by mutual agreement and such deductions shall be subject to such rules and regulations as NRA may impose to prevent unfair deductions or deductions which would have the effect of lowering the base rates of pay prescribed. Employees other than maintenance and supervisory men or those necessary to protect the property shall not be required to live in company houses. No employee shall be required to trade at company stores. Except where state laws name a higher minimum, no person under 16 shall be employed inside the mine or in hazardous occupations outside.

The code calls upon NRA to appoint an agency to make a study of the effect of the rates prescribed and the practicability and cost of applying a shorter work day and work week and to inquire whether sales prices obtained or reasonably anticipated warrant further increases in wages and employment. A report on these matters is to be made not later than Nov. 30, 1933, and a conference is to be called the following day to determine what, if any, revisions should be made in the code. Unless revised by mutual agreement or as the result of such conference, the hours, wages and differentials set out in the code would continue until April 1, 1934, and thereafter during the life of NIRA unless changed by mutual agreement and approved by NRA or by action of the National Bituminous Coal Labor Board.

Selling at less than a fair market price is a violation of the code. In determining fair market prices, competition with other coals and with other fuels and sources of energy may be taken into consideration. Where there is a marketing agency or agencies in any district acting for producers representing at least two-thirds of the commercial tonnage by volume and numbers, the minimum prices established by such agencies shall govern. Where no such agencies exist, such minima shall be established by the Divisional Code Authorities.

Fair market prices so established shall be published on the effective date of the proposed code after approval by the National Recovery Administrator, "who in his approval may permit a reduction or increase in said prices by action of said agencies or Authorities within the limits he may prescribe, and thereafter shall be published whenever any change is made therein and not less frequently than once each month on the first of the month." Records and data of the marketing agencies and Divisional Code Authorities at all times shall be open to inspection by the designated agent of the Administrator and changes in prices disapproved by said agent shall not become effective unless and until approved by the Administrator.

Unfair trade practices condemned in

Table I—Basic Inside Day Rates Proposed in Various Coal Codes and by the NRA

	Proposed by— Operators	NRA
Alabama, Georgia, southern Tennessee	$2.40[1]	$3.00
Southern West Virginia, Potomac district of West Virginia, Maryland, Virginia, eastern Kentucky and northern Tennessee	3.44	4.20
Northern West Virginia	3.60	4.36
Pennsylvania, Ohio, northern West Virginia Panhandle	3.84[2]	4.60
*Michigan	.....	4.60
West Kentucky	2.64[3]	3.84
Indiana	4.00[4]	4.57½
Illinois	5.00[5]	5.00
Iowa (except Wayne and Appanoose counties)	4.70	4.70
†Wayne and Appanoose counties, Iowa	.....	3.75
†Arkansas	.....	3.75
Missouri, Kansas, Oklahoma	3.52[6]	3.75
New Mexico, southern Colorado	4.25	4.25
Northern Colorado	5.00	5.00
Wyoming	5.42	5.42
Utah	5.44	5.44
Montana	5.63	5.63
Washington	5.40	5.40

*Included with Pennsylvania, Ohio and the northern West Virginia Panhandle by the NRA. †Included with Missouri, Kansas and Oklahoma by the NRA.

[1]Basic scale proposed in the Alabama code; minimum rate for unskilled inside labor proposed in the code for hand mines in Hamilton, Sequatchie, Marion, Bledsoe and Rhea counties, Tennessee, and Walker and Dade counties, Georgia, $2. [2]Basic scale proposed in southern Ohio code, $3.28 (union scale). [3]Minimum scale for common able-bodied inside labor. [4]Minimum inside rate proposed in the Indiana code, trapper boys in shaft mines and water boys in strip pits excepted; basic union scale in Indiana is $4.57½. [5]Basic inside rate for the entire bituminous industry proposed in the general code, subject to the establishment and/or maintenance of differentials in the East, Southwest and Rocky Mountain-Pacific region; also basic rate proposed in codes of the Coal Producers' Association of Illinois and the Progressive Miners of America; Off-Railroad Coal Mine Operators proposed a basic scale of $4. [6]Shaft mines in Randolph, Adair and Macon counties, Missouri, $3; McAlester and Wilburton districts, Oklahoma, $3.76.

most of the codes originally filed (see August issue, pp. 279-285) also come under the ban. Provision is made for an investigation into the trucking situation by the National Bituminous Coal Board. Special prices to meet the competition of imported coal are authorized.

Base wage rates named in the code cover inside labor, including tracklayers, bottom cagers, drivers, trip riders, grippers, water haulers, machine haulers and timbermen. Differentials over and under these rates for other occupations must be continued. Where different rates have been arrived at by collective bargaining, the contract rates shall govern. Tonnage, yardage, deadwork and strip and mechanized mining rates must be submitted to NRA for approval within fifteen days after the code has become effective. Where rates have been made by collective bargaining, a report must be made of such agreements. The code base rates are shown in Table I.

The most sweeping attack upon the provisions of the proposed code was made by the Appalachian group, with the Alabama commercial operators a close second. Western Kentucky centered its attack upon the proposal to increase its base inside rate from 33c. to 48c. per hour—an increase which, it declared, threatened the existence of the district. In common with the Appalachian and Alabama groups, western Kentucky also objected to the proposal to relate the code minima to rates for other occupations as fixing maximum rates. Such a procedure, it is argued, is contrary to the provisions of Section 7 (c) of NIRA. Illinois operators wanted it to be understood that the differentials between different producing districts proposed in the code should not be invoked as a precedent in any future negotiations and asked that the code be modified to make that understanding plain. Other groups and individual companies poured in their specific criticism of this clause and that by messenger, mail and telegraph and NRA officials were kept busy over the week-end tabulating and analyzing these objections for consideration at the meeting today.

Six fundamental objections to the code as a whole and 28 specific criticisms of individual clauses were offered in a statement of several thousand words submitted by the Northern Coal Control Association and the Smokeless and Appalachian Coal Association. The major objections were:

(1) That the proposed code deprives the owners of the mines of practically all rights of management and turns these functions over to union labor and to the government;

(2) That the labor provisions of the proposed code are designed throughout for operation only in connection with a labor union and give no consideration to the rights of the individual employee or groups of employees;

(3) That the Administration provisions leave the Appalachian group, with 70 per cent of the national production, only a decided minority vote in the exercise of such limited functions as the code leaves to owners and management;

(4) That the code attempts to extend government control to matters not within that control and to infringe upon the constitutional right of private contract;

(5) That the code attempts to control the industry along national lines rather than upon the natural district lines established by the geographical location of coal deposits and that such division results in an unbalanced situation as to tonnage production, with 71.5 per cent of the output in Division I, 16.2 per cent in Division II, 3.1 per cent in Division III, 2.9 per cent in Division IV and 6.3 per cent in Division V;

(6) That in prescribing minimum wages for particular classifications of labor and calling for the maintenance of existing differentials over and under those rates for other occupations, the code is prescribing maximum as well as minimum rates in defiance of the plain intent of the law.

In its detailed criticisms, the Appalachian group makes objection to the failure to include coke workers; to the marketing provisions; to the maximum work week, which is in conflict with the proposed agreement with the union for a 40-hour week; to the provisions for tonnage rates; to the failure to include a "merit" clause similar to that in the automobile code. Exception also is taken to the proposals governing deductions as a limitation on the freedom of the employee to obtain advances of credit or to engage in any commercial transaction with his employer without the consent of the government. This group also would strike out the provisions with respect to living in company houses and trading at company stores as an unjustifiable reflection on the industry as a whole. Attention is called to the fact that the NRA code mediation machinery makes no attempt to prevent strikes while disputes are being mediated. In conclusion, NRA is asked to approve the revised code filed by this group.

In addition to its general objections, which follow the same trend as those voiced by the Appalachian group, the Alabama group reiterates its declaration that the wages named in the code originally filed by the commercial operators of that state are as high as the mines can pay under existing conditions. The suggestion is made that NRA provisionally accept the scale proposed by the Alabama operators with the understanding that it be reconsidered if changed conditions should justify a revision.

At today's meeting, NRA met objections to the administration code by calling upon the operators to appoint a joint committee to work with the NRA staff in framing a new code which, it is hoped, would be acceptable to at least the major part of the industry. This was in sharp contrast to the step taken at the Aug. 18 meeting, when each sponsoring group was asked to name a small committee, but no provision was made for joint action. In addressing today's meeting, General Johnson presiding, Donald Richberg, chief counsel for the NRA, declared that the administration code was not offered with the object of ultimately imposing it in mind but for the consideration and criticism of the industry. It was intended to reconcile as far as possible the divergent views voiced in the 30-odd codes and supplements originally filed by various interests. "What solution may eventually be reached," he said, "has not yet been determined." The aim, however, is self-government in the industry. If it is impossible to handle the situation nationally, it may be possible to treat the industry regionally.

NRA asked, therefore, that two committees of nine members each be appointed, one to work with NRA on the question of code administration and the setting up of machinery, and the other to take up all the other provisions with the exception of minimum wages, which, Mr. Richberg added, must be given separate treatment. The treatment or machinery in mind was not revealed, however. Each committee was to be made up of four members from Division I of the industry, as set up in the NRA code draft, two from Division II, and one each from the other three divisions. At the operators' caucus, immediately after the conference, the following were selected as representatives of the various divisions:

Division I—E. C. Mahan, president, Smokeless and Appalachian Coal Association; H. R. Hawthorne, vice-president, Pocahontas Fuel Co.; Heath S. Clark, vice-president, Rochester & Pittsburgh Coal Co.; Wm. Emery, Jr., president, Cambridge Collieries Co.; Scott Stewart, president, W. J. Rainey, Inc.; Ralph E. Taggart, vice-president, Stonega Coke & Coal Co.; James D. Francis, vice-president, Island Creek Coal Co.; Charles O'Neill, vice-president, Peale, Peacock & Kerr, Inc.

Division II—T. G. Essington, general counsel, Illinois Coal Operators' Association; George W. Reed, vice-president, Peabody Coal Co.; C. G. Hall, general manager, Walter Bledsoe & Co.; George Heaps, Jr., Iowa Coal Operators' Association.

Division III—Forney Johnston, counsel for the Alabama commercial operators; D. A. Thomas, president, Montevallo Coal Mining Co.

Division IV—W. C. Shank, president, Southwestern Coals, Inc.; E. M. Douthat, Sinclair Coal Co.

Division V—F. V. H. Collins, president, Bair-Collins Co.; John R. Doolin, executive secretary, Utah Coal Producers' Association.

In addition to the interests represented on the committee of eighteen, the following were appointed as representatives of other groups: Coal Control Association of Georges Creek and Upper Potomac, A. B. Crichton, Douglas Gorman and Charles E. H. Brown; western Kentucky, C. F. Richardson and K. U. Meguire; American Wholesale Coal Association, Arthur Hale; North Dakota Lignite Operators' Association, Stanley B. Houck; Southern Indiana Coal Producers' Association, W. R. Bootz; Southern Ohio Coals, Inc., George M. Jones, Jr., Paige C. Morris and George K. Smith; Taplin interests, George M. Jones; Preston County, West Virginia, H. B. McNary, Paris Shay, A. W. Hawley and John F. Atkin; Somerset County (Pa.) Coal Operators' Association, J. S. Brennan; Coal Producers' Association of Western Pennsylvania, A. R. Budd; Panhandle (W. Va.) Coal Operators' Association, F. Costanzo, R. J. Cotts, W. R. Cotts and George A. Blackford; St. Clair-Madison County (Ill.) Coal Operators' Association, W. L. Miller; Rocky Mountain Fuel Co., Josephine Roche and John R. Lawson; coal stripping operations, R. H. Sherwood; United Mine Workers, John L. Lewis, Philip Murray, Van A. Bittner, Percy Tetlow and Thomas Kennedy.

Labor Unrest Reflected in Bituminous Strikes; Anthracite Insurgents Organize

While representatives of the National Recovery Administration were able to induce strikers to end the western Pennsylvania stoppage early in August, dissatisfaction with the delay in adopting a code for the bituminous industry and differences over union recognition were reflected in several additional walkouts during the month. The western Pennsylvania strike, which started at the mines of the H. C. Frick Coke Co. in July, and later spread to central Pennsylvania, was thought to have been ended as a result of two truce agreements (August *Coal Age*, p. 286) drawn up on Aug. 4. At this point, however, a number of insurgents came into the picture and the Communist National Miners' Union attempted to take a hand, with the result that a majority of the western Pennsylvania srikers refused to return to work on Aug. 7, the date set for the end of the stoppage. As a result, Edward F. McGrady, assistant administrator of the NRA, was dispatched to Fayette County on Aug. 8. Upon receiving his assurance that the administration would protect their interests, the strikers voted to resume work the following day.

The resumption, which coincided with the promulgation of rules for the election of checkweighmen by the Coal Mediation Board, organized last month to settle disputes under the truce agreement, was complicated by controversies over the selection of checkweighmen and the reinstatement of strikers. As a result of complaints by the men to the NRA, conciliators were sent into the field to iron out differences that affected a number of operations and kept several closed for varying periods. While settlements were made in a majority of cases, a new wave of dissatisfaction with the progress of code negotiations resulted in a strike of 1,300 men at three Pittsburgh Coal Co. mines, near West Newton, Sept. 6, and in preparations for walkouts at other operations.

The alleged discharge of miners for union activity precipitated a strike in the St. Charles district, Lee County, Virginia, Aug. 22, which later spread to Wise County. Operations chiefly affected, according to reports, were those of the Blue Diamond Coal Co., Benedict Coal Corporation, Virginia Iron, Coal & Coke Co., Blackwood Coal & Coke Co., and the Stonega Coke & Coal Co. Approximately 2,600 men in Lee County and 4,000 men in Wise County were reported idle. The strike is said to be the first in the southwest Virginia field. On Sept. 6, several hundred miners returned to work at the Benedict mine of the Benedict Coal Corporation, St. Charles. The Penn Lee mine of the Tomlinson Coal Corporation resumed on Sept. 5.

A number of operations in Bell County, Kentucky, also were closed by strikes in August, and the disaffection was reported to have spread to a few operations in Harlan County. Reports at the end of the month indicated, however, that the miners were returning to work. Harlan County miners also were reported to have gone into the Virginia strike centers to lend their aid to the stoppages there.

Formation of the "Independent Miners' Union" by coal companies in western Kentucky resulted in a number of complaints of interference and coercion to the NRA by sympathizers of the United Mine Workers. A labor conciliator was dispatched to the district on Aug. 24 to compose differences over the activities of the United Mine Workers and the company organization. Mines involved in the dispute were those of the Blue Valley, Dawson Daylight, Norton, West Kentucky, Hart and Ruckman coal companies.

While a few operations were reported to have been closed down, conciliators from the U. S. Department of Labor persuaded 5,000 Alabama miners to withdraw plans for a general strike in August and await the formulation of a bituminous code.

The shooting of a picket from ambush near the old Universal mine, Universal, Ind., now operated on a cooperative basis, precipitated a protest strike on Aug. 7 which involved between 4,000 and 5,000 men at twelve operations in the Clinton field in Vermillion County. A majority of the men, it was reported, returned to work Aug. 14.

Two bitter strikes were staged by the National Miners' Union in Carbon County, Utah, and McKinley County, New Mexico, in August. The Utah stoppage, which was carried on by 500 sympathizers of the Communist union, started at the Spring Canyon mine of the Spring Canyon Coal Co., Aug. 17, and later spread to the operations of the Mutual, Blue Blaze, Sweet and National coal companies. The demands of the strikers, according to a representative of the National Miners' Union, included: recognition of the union; a 25-per cent cut in house rent; election of checkweighman by the men, his pay to come out of their pockets; payment of employees on the fifth and twenty-fifth of each month; eight hours of work per day, tipple not to start before 7 a.m., with time and one-half for overtime, including work before 7 a.m.; work notifications to be posted before 4 p.m. on the preceding day, there to be no work if the notice be posted after four.

Several hundred deputies, including members of the United Mine Workers, said to control 85 per cent of the miners in the county, were sworn in to keep order and prevent picketing. Following the arrest of more than 300 pickets and the issuance of warrants for leaders of the National Miners' Union, the backbone of the strike was broken in the last days of August and the closed mines reopened.

With the collapse of the Utah strike, the National Miners' Union transferred its efforts to the Gallup field, McKinley County, New Mexico, which includes the operations of the Defiance, Diamond, Gallup American, Gallup Southwestern and Mutual coal companies. Five National Guard units were sent into the district on Aug. 31 to keep order.

A voluntary increase in wages for the Hocking, Pomeroy Bend, Crooksville and Jackson districts in southern Ohio was posted by the operators on Aug. 16 after a conference with representatives of the United Mine Workers. The new scale is to remain in effect until an all-Ohio scale is formulated or a national code for the bituminous industry is adopted. Basic day rates were increased from $3.28 to $3.87 per day, the loading scale from 38 to 42c. per ton, and the machine cutting scale from 6 to 7c. per ton.

The question of equalization of working time between anthracite collieries, long a disturbing factor in the hard-coal region, resulted in a short-lived attempt to close down the operating collieries of the Lehigh Navigation Coal Co. in the Panther Creek Valley last month. The drive was precipitated by the company's announcement that it would open the Tamaqua stripping on Aug. 14 and ship the coal to Coaldale colliery for preparation. Contending that it was unfair to ship to Coaldale while the nearer Tamaqua and Greenwood collieries were idle, unemployed miners, together with citizens in the district, demanded at a demonstration at Lansford, Aug. 17, that work be spread out among all the company's operations. This, the company replied, it was unable to do, with the result that on the following day the unemployed contingent descended on the Alliance and Cranberry operations and closed them.

Plans were then made for extending the drive to other companies in the southern anthracite field, and this possibility led Governor Pinchot to request aid from the NRA. Howard Colvin, a special agent of the National Industrial Recovery Adjustment Board, was dispatched to the district on Aug. 19, and a mass meeting was held at Coaldale, Aug. 20, at which tme the miners agreed to end their efforts pending the adoption of a code for the anthracite industry. The Lehigh Navigation company opened the Greenwood colliery a few days later.

Insurgents and expelled members of District 1, United Mine Workers, covering the northern anthracite field, completed organization of the "United Mine Workers of the Anthracite Region," later changed to the "Anthracite Mine Workers of Pennsylvania," early in August, and in its first test of strength tried to close down the Capouse and Von Storch mines of the Penn Anthracite Mining Co. on Sept. 5. At the insurgent convention, which began on Aug. 7 and was attended, according to reports, by representatives of 71 of the 125 locals in District 1 before it ended on Aug. 12, Thomas Maloney, Wilkes-Barre, Pa., who was expelled from the United Mine Workers last year for leading an illegal strike against operations of the Glen Alden Coal Co., was elected district president, and Rinaldo Cappellini, former president of District 1 and one-time leader of one of the major rebellions against regular officers, was chosen president of the state organization. Plans were laid for extending the organization to Districts 7 and 9 of the United Mine Workers, and state headquarters were opened in Wilkes-Barre, Pa., after the convention closed.

The attempt to close the Penn Anthracite operations, which grew out of the discharge of fifteen employees, was preceded by clashes between pickets and members of the United Mine Workers at the Capouse mine and at the Gravity Slope colliery of the Hudson Coal Co. The Gravity Slope incident, according to an insurgent official, was a mistake, as it was intended that the pickets should go to the Johnson operation of the Penn Anthracite Mining Co. However, several miners going to work at the Jermyn mine of the Hudson Coal Co. were attacked by pickets on Sept. 6.

Rate Reduction Denied

In its second major rate decision within a week (Docket 23430 and related cases), the Interstate Commerce Commission on Aug. 11 denied the contentions of the Central Pennsylvania Coal Producers' Association and the Somerset-Meyersdale, Cumberland-Piedmont and Western Pennsylvania coal traffic bureaus and declared lawful interstate track delivery rates on bituminous coal from mines in Pennsylvania, Maryland and northern West Virginia to destinations in trunk-line and New England territories, with the exception of rates from the Cumberland-Piedmont-Meyersdale district to Chambersburg and Greencastle, Pa., which were declared unreasonable for the future to the extent that they exceed $2.46 per long ton. The old rate was $2.71. Although not at issue, transshipment rates on coal from these regions to the ports of New York, Philadelphia and Baltimore also were found not unlawful.

In the same decision, the commission granted the request of carriers in a number of fourth-section applications for the continuance or establishment of rates from the Clearfield and related districts, Maryland and northern West Virginia to New England destinations without observing the long-and-short-haul provision to enable them to compete with coal moving by water through Hampton Roads.

First-Aid Meets

In addition to taking first place in the mine-rescue contest, the Harlan Wallins Coal Corporation team, Verda, Ky., came out with the highest combination score for both the mine-rescue and first-aid events at the Eastern Kentucky Mine-Rescue and First-Aid Meet, held at Hazard, Aug. 12. By repeating its feat of last year, the Harlan Wallins team gained permanent possession of the National Coal Association trophy. In the first-aid contests, first places went to teams from the following districts: Hazard—Kentucky-West Virginia Power Co., Hazard; Harlan—King Harlan Co., Kildav; Cumberland River—Blue Diamond Coal Co., Bonny Blue, Va.; Big Sandy—Consolidation Coal Co., Mine 204, Jenkins. The Mine 204 team also took first place for the entire first-aid meet. In the colored group, the United States Coal & Coke team, Lynch, took first honors in first-aid.

Three coal-mining teams walked off with the honors at the first-aid meet held by the Hastings (Pa.) Volunteer Fire Co., Aug. 5. First place went to the Sterling Coal Co., Bakerton, Pa., while second and third honors, respectively, were carried off by the Webster Coal & Coke Co., Nanty-Glo, Pa., and the Pennsylvania Coal & Coke Corporation, Marsteller, Pa.

Thirty-nine teams competed in the fourth annual safety meet of the New River & Winding Gulf Mining Institute, held before an audience of 5,000 at Beckley, W. Va., Aug. 26. A run-off problem was necessary to break the tie for first place in the white group, and as a result first, second and third places, respectively, went to the following teams: C. C. B. Smokeless Coal Co., Long Branch; Cranberry Fuel Co., Sprague; and the New River Co., Summerlee. Fourth, fifth and sixth places, respectively, went to the Price Hill Colliery Co., Price Hill; C. C. B. Smokeless Coal Co., Stotesbury; and the Cranberry Fuel Co., Cranberry. First place among the colored teams went to the Price Hill Colliery Co., while second and third honors were carried off by the Cranberry Fuel Co., Cranberry, and the New River Co., Carlisle.

With nineteen teams competing, first place in the Western Kentucky First-Aid Contest, held at Madisonville, Ky., Aug. 26 under the sponsorship of the Kentucky Department of Mines, was won by the Reinecke Coal Co. team, Madisonville. Second place went to a team of the Green River Fuel Co., Mogg Ky.; third place to the Black Diamond Coal Co. team, Drakesboro, Ky.; and fourth place to the W. G. Duncan Coal Co. team, Greenville, Ky.

Twenty-eight teams competed in the eighth annual safety meet of the Coal River Mining Institute, held at Whitesville, W. Va., Sept. 4. First honors went to a team representing the Eunice mine of the Chesapeake & Ohio Ry. Co. fuel department, and second and third places went to teams from the Dorothy operation of the same company. Fourth, fifth and sixth places went to the following: American Eagle Colliery Co., Ameagle; Nellis Coal Corporation, Nellis; and the Youghiogheny & Ohio Coal Co., Van.

Virginia Mine in Deal

The McCoy (Va.) property of the Great Valley Anthracite Corporation, with a capacity of 1,000 tons per day, went back into production last month under the direction of the Great Valley Morgan Coal Corporation, which purchased the operation from the receivers on July 18. The new company is headed by H. W. Morgan, Sr., Washington, D. C., one of the receivers, and the other officers are as follows: vice-president in charge of operations, A. H. Morgan; vice-president in charge of sales, Calvin Brent Morgan; secretary, Thomas P. Morgan, treasurer, H. W. Morgan, Jr. The Great Valley corporation, together with the Merrimac-Morgan Coal Corporation, has entered into a contract with the Raleigh Smokeless Coal Co., Beckley, W. Va., for the sale of the output of both operations, and the Great Valley company on July 20 leased an adjoining tract of 1,000 acres which will be operated in connection with the McCoy tract of 4,000 acres. Dr. Marius M. Campbell, formerly principal geologist for the U. S. Geological Survey, is director of research for the Morgan companies.

Canadian Coal for Coke

Dominion efforts to foster the use of Canadian coal for coke-making purposes met with further success early in August when the Winnipeg Electric Co. and the Crow's Nest Pass Coal Co., Ltd., Fernie, B. C., entered into a contract providing for the exclusive use of Canadian coal at the Winnipeg gas works. A total consumption of 50,000 tons a year is reported to be involved, all of which formerly came from the United States. In eastern Canada, Dominion Steel & Coal Corporation subsidiaries divided an order for 35,000 tons of coal from the LaSalle Coke Co., of Montreal.

Coal Tar for Roads Objective Of New Bureau

Promotion of the bituminous industry through stimulation of the use of coal tar in road work is one of the principal objectives of the newly organized Road Tar Bureau, with headquarters in Pittsburgh, Pa. Immediate efforts, according to an announcement, will be concentrated in Pennsylvania, as it is one of the leading bituminous states and also accounts for one-third of the national output of crude tar. Included in the bureau membership are the following companies: Barrett Co., Koppers Products Co., Reilly Tar & Chemical Co. and the Ugite Sales Co., tar department of the United Gas Improvement Co.

Wyoming Company Starts Up

The Pacific Coal & Coke Co., incorporated July 17, has started to equip its property at Kemmerer, Wyo., in preparation for full-scale production in the near future. The product, it is reported, will move to the Northwest and the West Coast for bunkering purposes, and negotiations are under way with the Japanese government for bunkering its ships at Pacific ports. The development and operation of the new project is under the direction of J. P. Musgrove, vice-president and general manager, who has had a number of years' experience as a mechanical and mining engineer in Colorado.

Injunctions Granted D.L.&W.

In suits brought by the Delaware, Lackawanna & Western Coal Co. against the Blue Ribbon Coal Co., Inc., and the Blue Seal Coal Co., Inc., operating retail yards in Brooklyn, N. Y., Justice John F. Carew, of the New York Supreme Court, by orders signed on Aug. 23, enjoined the defendants or anyone acting under their orders or direction from the use of the words "blue coal" in any form whatsoever in connection with corporate names as long as they continue to sell coal, from using the words "blue coal" in connection with any advertising or correspondence and from selling or advertising for sale any article under the name "Blue Coal," "Blue Seal Coal and Coke," "Blue Ribbon Coal" or any other imitation of the trade name applied to the product of the Delaware, Lackawanna & Western Coal Co. The injunctions will continue until trial of the actions is completed.

Coming Meetings

National Safety Council; twenty-second annual safety congress and exposition, Oct. 2-6, Stevens Hotel, Chicago.

American Institute of Mining and Metallurgical Engineers, Coal Division; Oct. 27 and 28, Columbus, Ohio.

Illinois Coal Operators' Association; annual meeting, Oct. 31, Chicago.

Illinois Mining Institute; forty-first annual meeting, Nov. 3, Hotel Abraham Lincoln, Springfield, Ill.

Ohio Safety Drive Started

A three-months' safety drive in the southern Ohio coal field, under the sponsorship of the Ohio Division of Safety and Hygiene and the Ohio Department of Mines and Mining, was started at a mass meeting in Nelsonville, Aug. 30, with executives, safety directors, foremen, firebosses and others from mines in Hocking, Athens, Perry, Morgan, Meigs, Jackson and Gallia counties in attendance. Speakers at the meeting included Thomas R. Kearns, head of the Division of Safety and Hygiene, and James Berry, head of the Department of Mines and Mining.

Wholesalers Reorganize

At a meeting in Pittsburgh, Pa., in August, attended by a representative group of wholesalers, the American Wholesale Coal Association was reorganized with the following officers: president, C. S. B. Ward, vice-president, Wieman & Ward Co., Pittsburgh; vice-president, Harold D. Wright, vice-president, Republic Coal & Coke Co., Chicago; treasurer, Clyde E. Speer, president, Clyde E. Speer Coal Co., Inc., Pittsburgh; secretary, A. J. McCarthy, assistant treasurer, Wieman & Ward Co., Pittsburgh.

Oakmont Blast Kills Seven

Seven men were killed in an explosion at the Oakmont mine of the Hillman Coal & Coke Co., Barking, Pa., Sept. 11. Two sections of the mine were affected by the blast. Employees at work in other territories escaped without harm.

Personal Notes

N. P. RINEHART, consulting engineer, Mt. Hope, has been appointed chief of the West Virginia Department of Mines, succeeding Ernest L. Bailey, who resigned to join the State Road Commission.

HORACE MOSES, general superintendent, has been appointed general manager of the Gallup American Coal Co., Gallup, N. M., and will take over the duties of the late John M. Sully, vice-president in charge of operations.

LEWIS R. CLOSE, president, Lehigh Valley Coal Sales Co., New York, has been elected president of the Lehigh Valley Coal Corporation, succeeding Richard F. Grant, resigned.

JOHN A. CLARKE, JR., Nanticoke, Pa., lately superintendent of the No. 7 colliery, Susquehanna Collieries Co., has been appointed mine inspector for the Pennsylvania Department of Labor, and will examine mines applying for compensation insurance to the state fund.

CHARLES G. JOHNSON, Bridgeport, Ohio, has been made general manager of mines for the Lorain Coal & Dock Co., operating in Ohio, and the Lorado Coal Mining Co., operating in West Virginia. Prior to this promotion, Mr. Johnson was general superintendent of the Lorain Coal & Dock properties.

ARTHUR R. MILLER, formerly with the H. C. Frick Coke Co., has been made general superintendent of the Pittsburgh Terminal Coal Corporation properties, succeeding James Brookes, Castle Shannon, Pa., resigned. JOHN PREVOST, for some time acting head of the company's engineering department, has been made chief engineer.

Obituary

THOMAS MITCHELL CHANCE, consulting mining engineer and a partner in H. M. Chance & Co., died at Philadelphia, Pa., Sept. 1, at the age of 46. Mr. Chance entered the University of Pennsylvania with the class of 1905 and left in his junior year to undertake mining operations in Nevada, later becoming a member of the firm of H. M. Chance & Co. and participating in the development of the Chance sand-flotation process.

WILLIAM D. TYNES, 69, executive head of the Hardie-Tynes Mfg. Co., which he helped organize, died at Birmingham, Ala., Aug. 19, after a short illness. Mr. Tynes was long a leader in the development of hoisting equipment, mine fans, air compressors and other coal-mining equipment.

Industrial Notes

CHICAGO PNEUMATIC TOOL CO., New York, has opened a new branch office at 1028 Sixth Ave., South, Seattle, Wash., with A. M. ANDERSON as manager.

LEO I. SMITH, 45 Gorham Road, Belmont, Mass., has been appointed New England district representative by Roots-Connersville-Wilbraham, Connersville, Ind., manufacturers of blowers, gas exhausters and meters, liquid and vacuum pumps, inert gas machines, etc.

GENERAL ELECTRIC CO. and four of its associated companies have removed their New York offices to the new General Electric Building, 570 Lexington Ave. Included in the move are the following: executive offices; New York district office; air-conditioning department; electric refrigeration department; Atlantic division, incandescent lamp department; merchandise department; and plastics department of the General Electric Co.; General Electric Contracts Corporation; G. E. Employees Securities Corporation; General Electric Realty Corporation; and the International General Electric Co., Inc.

PROPERTIES of the International Combustion Engineering Corporation, New York, and affiliated companies, recently sold by federal court order, were taken over on Aug. 1 by the newly organized Combustion Engineering Co. Included in the properties acquired by the new company were the Combustion Engineering Corporation and the Hedges-Walsh-Weidner, Coshocton Iron and Raymond Bros. Impact Pulverizer companies, all of which will be operated under one management.

DWIGHT R. G. PALMER, vice-president and general sales manager, has been elected president of the General Cable Corporation, vice H. T. Dyett, resigned. DR. FRANK M. POTTER, in charge of the company's laboratory at Rome, N. Y., has been chosen vice-president.

JEFFREY MFG. CO., Columbus, Ohio, has acquired all the patent, manufacturing and selling rights to all the equipment heretofore manufactured and sold by the Traylor Vibrator Co., Denver, Colo., and will hereafter conduct the business of the company from Columbus as the Jeffrey-Traylor Division of the Jeffrey Mfg. Co. JAMES A. FLINT, vice-president of the Traylor company, will be in general charge of the new division.

Coal-Mine Fatalities

Coal-mine accidents caused the deaths of 69 bituminous and 15 anthracite miners in July, 1933, according to information furnished the U. S. Bureau of Mines by State mine inspectors. This compares with 71 bituminous and 13 anthracite fatalities in June. Based on a production of 29,842,000 net tons, the bituminous death rate in July was 2.34 per million tons, against 2.80 in June, when the output was 25,320,000 tons. The anthracite death rate rose from 3.31 per million tons in June, when 3,928,000 tons was produced, to 4.08 in July, based on a production of 3,677,000 tons. For the two industries combined, the July death rate was 2.53, against 2.87 in June.

Comparative fatality rates for the first seven months of 1933 and 1932, by causes, are given in the following table:

FATALITIES AND DEATH RATES AT UNITED STATES COAL MINES, BY CAUSES*

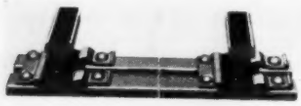
	Bituminous		Anthracite		Total	
	Number Killed	Killed Per Million Tons	Number Killed	Killed Per Million Tons	Number Killed	Killed Per Million Tons
January-July, 1932						
Falls of roof and coal	255	1.570	79	2.906	334	1.761
Haulage	68	0.419	21	0.773	89	0.469
Gas or dust explosions:						
Local explosions	8	0.049	5	0.184	13	0.069
Major explosions	54	0.332	..	.....	54	0.285
Explosives	7	0.043	8	0.294	15	0.079
Electricity	23	0.141	4	0.147	27	0.142
Machinery	11	0.068	1	0.037	12	0.063
Surface and miscellaneous	43	0.265	14	0.515	57	0.301
Total	469	2.887	132	4.856	601	3.169
January-July, 1933						
Falls of roof and coal	230	1.316	63	2.417	293	1.459
Haulage	79	0.452	15	0.576	94	0.468
Gas or dust explosions:						
Local explosions	12	0.069	8	0.307	20	0.100
Major explosions	...	.....	..	.....	...	.....
Explosives	11	0.063	4	0.153	15	0.075
Electricity	28	0.160	2	0.077	30	0.149
Machinery	8	0.046	..	.....	8	0.040
Surface and miscellaneous	30	0.172	19	0.729	49	0.244
Total	398	2.278	111	4.259	509	2.535

*All figures are preliminary and subject to slight revision.

WHAT'S NEW
IN COAL-MINING EQUIPMENT

Haulage Aids

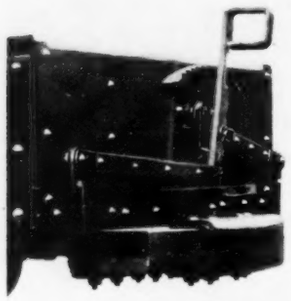
Bethlehem Steel Co., Bethlehem, Pa., offers a new steel room tie. This tie, designated as the No. 2 steel mine tie, is 93.5 per cent stronger than the tie it replaces, according to the company, while the weight of the section (2½ lb. per foot) is only 3 per cent more. These savings were accomplished by redesigning the section, and the tie is equipped with two broad stationary rail clips and four movable clips of a new design.



Bethlehem No. 2 Steel Room Tie

These clips, it is asserted, have a greater bearing area on the base of the rail than the old clips and therefore are not easily loosened by vibrations set up by track-type coal-loading and cutting machines. The new tie is painted red to distinguish it from the old model.

Bethlehem Steel Co. also has developed a safety brake handle for use on extra low and low-side mine cars. The end of the



Bethlehem Safety Brake Handle

handle is formed in the shape of a square so that when the brake is operated, the hand grasping the lower part of the square is protected against being caught between the top of the handle and the roof. The new brake handle, the company says, is especially suited for low-seam mines.

A weldless coupling link for mine cars, forged from a single piece of special steel, is another

Bethlehem Weldless Coupling Link

new haulage product offered by the Bethlehem Steel Co. The one-piece construction of this link, with a web in the center, makes it much stronger than the open-link type, according to the company. In tests to destruction, the link has shown a breaking strength of 220,000 lb. It is made in four standard lengths: 10½, 10¾, 11¾ and 14 in.

—❖—

Spray Nozzles

Chain Belt Co., Milwaukee, Wis., offers Rex spray nozzles for use in coal preparation plants and for other washing and cleaning purposes. Nozzle design which permits a round stream of water to hit a curved deflector plate with retaining sides results in a very low water consumption and gives a flat spray free from mist, with all the water directed at the material to be cleaned, the company states. The nozzle, it is asserted, will not clog with the débris usually found in water considered clean enough for washing purposes, as the throat in the large size will permit pebbles up to ¼ in. to pass. Any desired washing or

Rex Spray Nozzles

scrubbing action, it is asserted, can be obtained by properly spacing the nozzles on the supply pipe, placing the nozzles at the correct distance from the material to be washed and adjusting the water pressure. Two sizes are available. The "Big Washer" has a throat diameter of 1 1/32 in. at the discharge and is 4½ in. long; the "Little Washer" has a throat diameter of ⅛ in. and an over-all length of 2½ in.

—❖—

Expansion Bolt

To meet the demand for an expansion bolt which will support heavy overhead structures and yet can be easily reclaimed, the Ohio Brass Co., Mansfield, Ohio, offers the new O-B Bulldog expansion bolt, made up of an inclined shell, a wedge and a stud. After inserting this assembly in a 1¼-in. roof hole, the wedge is pulled down along the inclined plane of the shell by a tug on the stud, thus setting the device in the hole. The hanger is then

O-B Bulldog Expansion Bolt

screwed on the stud, and as it bears against the roof the wedge is pulled further down the incline plane, forcing both wedge and shell into the sides of the hole. Horizontal corrugations on the shell and vertical corrugations on the wedge anchor the device securely in the hole, according to the company, which declares that in actual service tests it was found impossible to pull the bolt out of the hole without tearing down part of the roof. On the other hand, it is declared, the bolt can easily be removed. Because the shell does not spread, it is necessary only to remove the hanger and tap the end of the stud with a hammer. This forces the wedge back along the inclined plane of the shell and allows the complete device to drop out of the hole.

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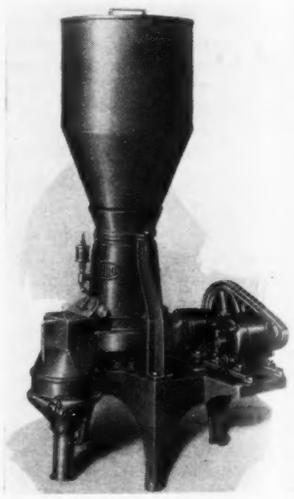
Lime Feeder

International Filter Co., Chicago, offers the "Infilco" No. 8 dry chemical feeder for accurate volumetric measurement of dry powdered, pulverized or granular materials, such as lime for neutralizing acid water. On

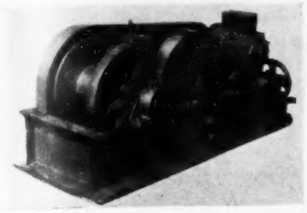


"Infilco" No. 8 Feeder

hydrated lime, according to the company, the feeder will handle a minimum of 2 oz. and a maximum of 100 lb. per hour. Samples collected at five-minute intervals will be identical in quantity within 5 per cent, the company says, due to the positive feed principle. Other features include sturdiness, compactness, dust-tight construction and cleanly operation. The rate of feed is controlled externally, and position of the feed knife is shown by a large dial and pointer. No locking device is necessary, it is pointed out.

Slow-Speed Hoist

Sullivan Machinery Co., Chicago, offers a new heavy-duty, slow-speed, single-drum, electric hoist, designated "CHE-5," for handling trips of cars at underground loading stations. Rope pull is 6,000 lb. at rope speeds of 25, 50 and 75 ft. per minute using a 5-, 10- or 15-hp. motor. Generally, the hoist is supplied with a 5-hp. motor for operation at a rope speed of 25 ft. per minute. Construction features



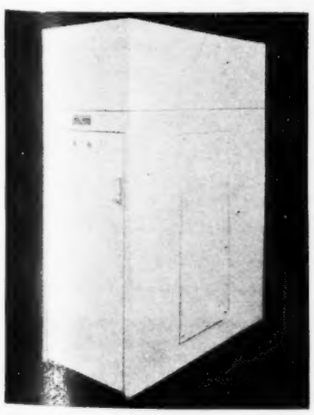
Sullivan "CHE-5" Slow-Speed Hoist

include: jaw clutch for releasing drum; powerful asbestos-lined brake operated by a self-locking hand wheel and a ratchet for holding the load when starting or stopping on an incline. The hoist, according to the company, may be adapted to remote control by changing the location of the starting switch, and by changing two gears it may be converted to a medium-speed hoist for hauling or hoisting service. The hoist also may be equipped with a "Turbinair" motor, if desired, the 7-hp. air motor giving a 6,000-lb. pull at 32 ft. per minute.

Metal-Clad Switchgear

Compact, totally inclosed switchgear has many installation, operating, maintenance and safety advantages, says the Delta-Star Electric Co., Chicago, and to meet the need for a factory-assembled

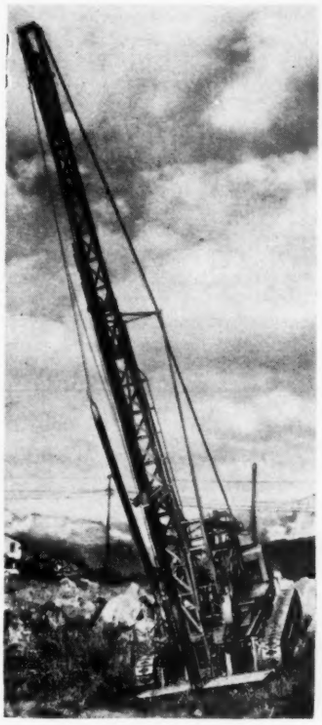
Exterior View, Metal-clad Switchgear



gear, the company offers the type illustrated for voltages up to 7½ kv. Oil circuit breaker, relays, plug-type disconnect switches, insulated buses, wiring, cable terminals, etc., are mounted on a steel frame which fits in a steel inclosure.

Drilling Machine

All-steel construction, full crawler mounting, chain drives throughout, dual spring shock absorbers for wire drilling, and unusual compactness, mobility and stability are among the features claimed for the new "Keystone" blast-hole and prospecting drill of the Keystone Driller Co., Beaver Falls, Pa. Over



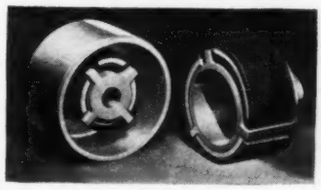
"Keystone" No. 71 Blast-Hole Drill

half the weight of only 6½ tons is concentrated in the crawler assembly, the company says, thus assuring unusual stability over rough ground. The driller is designed primarily for holes 6 in. or smaller in diameter to a depth of 900 ft., although larger holes can be drilled if desired. Fifteen hundred pounds of tools can be handled with ease, the company declares. Four lengths of stroke—18½, 22½, 26⅝ and 31 in.—are available.

Over-all dimensions are: length, without mast, 13 ft. ⅞ in.; with mast telescoped in traveling position, 24 ft. 7 in.; width, 8 ft. Traveling speed varies from 0.66 to 2.46 m.p.h. Ground bearing pressure is 5.81 lb. per square inch.

Multi-Duty Coupling

Falk Corporation, Milwaukee, Wis., has developed the Falk-Rawson "4-Duty" coupling for starting, coupling, cushioning and limiting the load. Its primary function is said to be that of a centrifugally operated automatic starter. Essentially, the construction involves two drum-shaped members, one attached to the driving and the other to the driven shaft. Between driving and driven members are inserted two sets of floating segments, usually made of brake lining reinforced with enough lead to give the required cen-



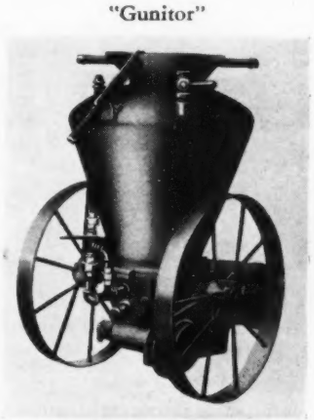
Falk-Rawson Coupling Disassembled

trifugal force for starting the load. The outer segments are actuated by the driving member and the inner by the driven member. The two are said to give just the right combination of smooth starting and overload protection. Advantages cited by the company are: protection of equipment through smooth starting and cushioning of loads; reduction of inrush current; ability to select motors operating closer to maximum capacity; elimination of shear pins; and fulfilling of the functions of a flexible coupling.

Concreting by Air

Gunitor Co., Elkhart, Ind., announces a complete line of "Gunitors" for the pneumatic application of concrete, cement mortar, refractory products or similar material, and for wet or dry sand-blasting. They may be purchased or leased. Con-

"Gunitor"



struction features, according to the company, include: light weight, reduced height and increased charging capacity. Models available include: one-man "Gunitors" with electric motors and remote control; "Combine-Gunitors" with gasoline engine, air compressor, water pump and "Gunitor" mounted on a steel towing chassis; and other types equipped with pug mixers and elevators for charging. Capacities range from 40 to 250 cu.ft. per hour, depending upon size.

Safety Switch

Electric Controller & Mfg. Co., Cleveland, Ohio, has announced the new Type A safety switch, said to feature ability to withstand severe service and compact construction. Small over-all dimensions, no projections and a vertical-opening cover are pointed out by the company, in addition to semi-floating double-break V-blades; V-shaped stationary contacts backed with steel springs; and

E. C. & M. Type A Safety Switch

individual arc-resisting asbestos barriers, all mounted on a single base which can easily be removed.

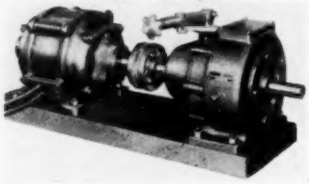
Diesel Caterpillar

Caterpillar Tractor Co., Peoria, Ill., announces the addition of the "Diesel Thirty-Five" to its line of diesel-powered caterpillar tractors. This tractor is powered with a three-cylinder engine, of which many parts are interchangeable with those used in the larger tractor engines, and provides four speeds ranging from 1.7 to 4.6 m.p.h. Weight is 13,900 lb.,

which is balanced by approximately 2,000 sq.in. of traction surface. Standard machines have a 53-in. tread, center-to-center of the 14-in. tracks; wide-gage models have a 74-in. tread. Track shoes of various widths are available for different classes of service. Positive starting, according to the company, is assured by an auxiliary gasoline engine.

Variable Reducer

Smith Power Transmission Co., Cleveland, Ohio, announces the new Johnson variable reducer for general industrial use. The unit is self-contained, according to the company, and



Johnson Variable Reducer

permits infinite variation in speeds from zero to any desired upper limit. Features pointed out by the company are: parts operate in an oil bath; control is visible and quickly manipulated; stopping action superior to that of a clutch, due to elimination of high speed inertia; strictly mechanical operation without the use of rolling or sliding friction; and noiseless operation. Capacities range from 1 hp. up.

Galvanized Wire

Bethlehem Steel Co., Bethlehem, Pa., has started shipments of its new "Bethanized" galvanized wire from its Sparrows Point (Md.) plant. This wire, according to the company, does not supplant hot-dipped galvanized wire, but is manufactured for special uses, such as telephone lines, where unusual resistance to twisting, bending and corrosion is desired.

Welding Rod

Metal & Thermit Corporation, New York City, has added "Murex" Universal welding rod to its line of heavy mineral-coated electrodes. The new rod, according to the company, is for use on mild steel, and may be employed for either flat, vertical or overhead work. Smooth, clean deposits of unusually high tensile strength and ductility, it is asserted, are consistently secured.

Welding Regulator

A new welding regulator equipped with a micrometer adjusting key housed within and operating separately from the main regulator key to enable the operator to adjust pressures below 1 lb. for the finest work, while at the same time handling heavy welding or cutting, is offered by the Alexander Milburn Co., Baltimore, Md. It may be used with oxygen, acetylene or other gases, according to the company.

Firing Equipment

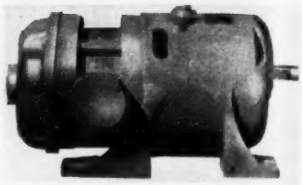
Babcock & Wilcox Co., New York City, offers a new combination pulverized-coal and oil burner for use with water-cooled furnace walls. The pulverized-coal burner is the standard B & W multiple intertube burner, while the oil burner is of the twin-nozzle type, and is inserted between two tubes in front of the pulverized-coal burner, extending back and through the burner casing, supported by a guide trough between the casing and the burner tip. The oil-burner tips are set so that the oil is distributed across the air stream for satisfactory mixing.

Babcock & Wilcox also offers the B & W circular multifuels burner, which it states is adaptable to combination firing through refractory burner walls in small and medium-sized industrial boiler units. Liquid, gaseous or pulverized solid fuels may be injected into the furnace through a common circular throat opening, either one at a time or in combination. An adjustable deflector, mounted at the furnace end of the primary-air and pulverized-coal pipe, insures intimate mixing of secondary air and a high degree of turbulence, it is asserted.

Another new product of the Babcock & Wilcox Co. is the B & W 80 Junior firebrick, developed for service requirements between those met by fireclay refractories on the one hand and premium-priced super-refractories or special bricks on the other.

Gearmotors

A new line of a.c. and d.c. gearmotors in sizes from ¾ hp. up is offered by the Reliance Electric & Engineering Co., Cleveland, Ohio. Outstanding features, according to the company, include: easily removed cartridge-type gear unit carrying all bearings except the high-speed pinion and bearing; simple helical gear train for quiet operation; feet cast integrally with the gear housing; ratios easily changed by changing the high-speed pinion and gear; four to eight positions of the output shaft obtained by rotating the cartridge gear unit; and bayonet-type oil gage.



Reliance Gearmotor

Ring Grinder

Ideal Commutator Dresser Co., Sycamore, Ill., offers the new "Luft Model" collector ring grinder, which it declares has the following advantages: eliminates lathe tools, dismantling of rotaries and the use of another machine to drive the equipment being trued; easily and quickly mounted; trued at normal operating speed; requires but two men; and cuts time of restoring machines to service 50 per cent.

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